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DIMENSIONALITY, RELIABILITY, AND UTILITY OF THE I-E SCALE WITH ANXIETY DISORDERS

by

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The undersigned certify that they have read, and recommended to the Faculty of Graduate Studies for acceptance, a thesis entitled, "Dimensionality, Reliability, and Utility of the I-E Scale with Anxiety Disorders" submitted by Heather Harper in partial fulfillment of the requirements for the degree of Master of Science.

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ABSTRACT

This study established the dimensionality and reliability of the Internal-External Locus of Control of Reinforcement (I-E) scale with a clinical population of anxiety disorder patients. The I-E instrument has been employed extensively in locus of control research among a normal population. However, relatively few studies have been conducted on an anxiety disorder population and thus far the findings have been inconsistent.

Although the I-E scale was originally devised as a unidimensional measurement, the research literature has clearly shown it to be multidimensional. To date, there have been no factor analytic investigations of I-E published on anxiety disorders.

In this study, I-E responses were analyzed for an Australian population of 260 anxiety disorder patients. The data was factor analyzed according to the principal components method with orthogonal varimax rotation. A two factor solution was interpreted as having the most intelligible factor structure. In accordance with prior research, the two factors that emerged were reflective of a general control dimension and a political dimension. However, this factor solution accounted for only a small proportion of the total variance. Furthermore, the internal consistencies of the two subscales were inadequate for a clinical population.

Although the hypothesis that an anxiety disorder sample would exhibit a multidimensional factor structure on the I-E scale in accordance with the results of studies based on samples from a normal population was confirmed, the unreliability of the subscales may discount the practical utility and overall validity of the instrument. Implications of the study were discussed with respect to both previous and future research. The psychometric shortcomings of the I-E scale challenge the continued usage of the instrument with anxiety disordered subjects. Clearly, the development of a new locus of

control measurement for anxiety disorders with meaningful and reliable subscales is needed, should further studies support these findings.

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CHAPTER I

INTRODUCTION

An abundance of research pertaining to the internal-external locus of control construct has emerged over the past two decades. This research has progressively evolved to a level in which it now occupies a prominent position in personality investigations (Lefcourt, 1980). In 1975, Thornhill, Thornhill, and Youngman published a computerized bibliography on locus of control which was comprised of more than 1200 references. Publications have continued to escalate, as reflected in a recent computerized Psych Info search, conducted in 1987 for the purpose of this study. A total of 5291 publications incorporating the locus of control construct were cited in this literature search. Moreover, Rotter (1975) commented that "the number of unpublished investigations, master's theses, and doctoral dissertations dealing with this topic are impossible to estimate" (p.56).

Upon surveillance of the wide range of locus of control research areas, Prociuk and Lussier (1975) found that the predominating topics include personality functioning, psychological adjustment, academic achievement, strategy preferences and learning, social influence processes, and information acquisition and use. The most widely employed instrument for measuring the locus of control construct among adults continues to be the Internal-External Locus of Control of Reinforcement (I-E) scale published by Rotter in 1966 (Craig, Franklin, & Andrews, 1984; Gabbard, Howard, & Tageson, 1986; Hill & Bale, 1981; Lefcourt, 1980, 1981). Although literature surveys (Joe, 1971; Lefcourt, 1976; Phares, 1976; Rotter, 1966) have provided documentation on the reliability and validity of the I-E scale in a variety of research settings, little attention has yet been given to the observation that the reliability coefficients are consistently low.

Despite the proliferation of locus of control (LOC) research, the vast majority of LOC studies utilizing the I-E scale have been directed towards normal populations, predominantly college students. Among the growing body of LOC investigations using clinical populations, research on anxiety disorder populations is beginning to appear in the literature (Adler & Price, 1985; Craig et al., 1984; Emmelkamp & Cohen-Kettenis, 1975; Fisher & Wilson, 1985; Hoehn-Saric & McLeod, 1985; Michelson, Mavissakalian, & Meminger, 1985). Thus far, the findings on the LOC construct using anxiety disorder subjects have been incongruent and methodological pitfalls prevail, precluding the advancement of any definite conclusions. However, the emergence of these studies is timely, when one considers that the area of anxiety disorders is receiving renewed attention from both the public and clinical sector (Tuma & Maser, 1985). This study concerned itself with acquiring more information on the LOC construct in the context of a population of anxiety disorders.

A fundamental assumption about the LOC construct is that it is unidimensional in nature (Rotter, 1966). In keeping with this theoretical perspective, Rotter (1966) and his collegues designed the I-E scale as a unidimensional measure. However, a number of factor analytic investigations have since shown the I-E scale to be multidimensional (e.g., Cherlin & Bourque, 1974; Lange & Tiggeman, 1981; Mirels, 1970). This, subsequently, has spawned both methodological and theoretical issues and controversies among researchers. To date, no factor analytic research of the I-E scale with clinical populations has been published. Therefore, no empirical evidence is available on the dimensionality of the I-E scale using an anxiety disorder population. This study concerned itself with the factor structure of the I-E measurement using anxiety disorder subjects. More specifically, this investigation intended to secure information on the dimensionality and reliability of the I-E scale, not only to generate normative data but also to ascertain the utility of this measurement with an anxiety disorder population. Hence, this research had an exploratory focus.

The few studies that have investigated LOC among anxiety disorders have produced conflicting results. The intent of this study is to determine the role of the I-E scale as a reliable measure of LOC in an anxiety disorder population.

Statement of the Problem

The objective of this study was to establish whether the existing I-E scale is a reliable and valid measure for an Australian population of anxiety disorders. The specific aims of this study were: (1) to establish the factor structure of the I-E scale for anxiety disorder subjects, (2) to ascertain whether anxiety disorder subjects exhibit the same LOC structure on the I-E scale as the normal population, and (3) to provide normative data for the I-E scale with a population of anxiety disorders.

CHAPTER II

REVIEW OF RELATED LITERATURE

A review of the literature related to this study is organized under the following sections:

1. Locus of Control Construct
2. Rotter's Internal-External Locus of Control Scale
3. Factor Analytic Studies of the I-E Scale
4. Anxiety Disorders
5. Locus of Control with Anxiety Disorders

Locus of Control Construct

The locus of control (LOC) construct has its basis in Rotter's social learning theory (Rotter, 1954; James and Rotter, 1958). Social learning theory (SLT) integrates the diverse psychological traditions of stimulus- response and cognitive theories. This combined framework emphasizes that cognitive processes serve as mediators between the stimulus and the response.

Expectancies, behaviours, reinforcements and psychological situations comprise the variables in SLT. This theory postulates that behaviour occurs as a function of expectancy and reinforcement within a specific situation (Rotter, 1975). In the SLT context, the term expectancy is described as the person's beliefs that given behaviours will cause given outcomes. The term reinforcement refers to an event that has the capability to shape behaviour (Lefcourt, 1980). SLT theorists maintain that the degree to which a person attributes reinforcement in a situation to their own action is of paramount significance in influencing their learning (Gore & Rotter, 1963).

Rotter (1954) differentiates expectancies according to whether they are general or specific. If a situation is novel or ambigious, Rotter contends that individuals will rely on generalized expectancies that have served them in the past. On the other hand, if the components of a situation are straightforward or routine, then individuals will use specific expectancies. The distinction between expectancies is an arbitrary one, and as such, is viewed as varying along a continuum from general to specific.

This distinction is illustrated in the following example. A student wished to succeed on a particular examination and perceives studying as a practical means of achieving this goal. In this instance, the specific formulation of expectancy would be, "If I study all of the material pertaining to the course, then I should achieve a good grade on the upcoming test." This specific expectancy may have emanated from one of the students more generalized expectancies, that being, "Academic achievement results from studying." Moreover, this generalized expectancy may have been derived from an even more global generalization, that being, "What one gets out of life is based on what one puts into it." It is from within the realm of generalized expectancies that the LOC construct emerges.

The internal-external LOC construct is described as a generalized expectancy of reinforcement that occurs when individuals have learned that events are contingent or non-contingent on their behaviour (Rotter, 1966). In essence, this construct depicts the degree to which an individual believes that he or she possesses or lacks the power to control what occurs in life situations. Rotter (1966) defined the construct in the following way:

> When a reinforcement is perceived by the subject as following some action of his own but not being entirely contingent upon his action, then, in our culture, it is typically perceived as the result of luck, chance, fate, as under the control of powerful others, or as unpredictable because of the great complexity of the forces surrounding him. When an event is interpreted in this way by an individual, we have labeled this a belief in *external* control. If the person perceives that the event is contingent upon his own behaviour

or his own relatively permanent characteristics, we have termed this a belief in *internal* control (p.1).

Thus, depending on one's past reinforcement experiences, an individual will have formed a consistent attitude tending toward either an internal or external LOC as the source of reinforcement. Rotter (1975) perceived the LOC construct as a stable attribute of individuals, as well as unidimensional in nature.

Several instruments to measure LOC are now available to the researcher. As mentioned previously, the most widely utilized measurement is Rotter's (1966) I-E scale which will be discussed in depth in the next topic section. A number of the LOC instruments are essentially revisions of the 23 item I-E scale. Moreover, many of the LOC scales and revised I-E instruments were designed to assess specific settings or subpopulations, some of which will be identified here. Levenson (1973) developed a generalized multidimensional version of Rotter's I-E, which is comprised of three subscales labelled Internal, Powerful Others, and Chance. By constructing three subscales, Levenson relinquished any requirement for internality and externality to be dichotomous. This scale has been deemed useful in a number of research applications, which are described in a comprehensive review article by Levenson (1981). The Crandall Intellectual Achievement Responsibility Scale (Crandall, Katkovsky, & Crandall, 1965) was developed to assess children's acceptance of responsibility for their successes and failures, as well as to measure these responsibility ascriptions within academic settings. A health focused LOC scale has been devised by Wallston, Wallston, and DeVellis (1978) to measure perceptions of control over catching a disease and remaining healthy. Hill and Bale (1981) constructed the Mental Health Locus of Control Scale which is designed to predict mental health behaviours, most notably those occuring in treatment situations. Craig et al. (1984) developed the Locus of Control of Behaviour scale to assess the degree to which individuals perceive responsibility for their personal problem behaviour. Reid and Ziegler (1981) constructed a scale to measure elderly persons' beliefs about their ability to control reinforcements that they acknowledge are of significance to them. As a final example, Worell and Tumilty (1981) revised the I-E scale and constructed a 24- item measurement called the Alcoholic Responsibility Scale (ARS). The ARS assesses the extent to which alcoholics assume responsibility for their drinking.

In summary, the LOC construct was derived from Rotter's (1954) social learning theory and has been used extensively in psychological research over the past 20 years. Coinciding with the popularity of the LOC construct has been the emergence of a variety of LOC measurements. The trend among research developers of LOC instruments appears to be in the direction of constructing specific scales for particular subpopulations and settings.

Rotter's Internal-External Locus of Control Scale

Although a large number of LOC scales have emerged over the past 20 years, the most widely employed LOC scale for adults is Rotter's Internal-External Locus of Control of Reinforcement scale (I-E) (Craig et al., 1984; Gabbard et al.,1986; Strickland & Haley, 1980). Rotter and his colleagues, namely, Phares, James, Liverant , Crowne, and Seeman were the main contributors to the development of the I-E scale which was published in Rotter's well-known 1966 monograph.

The I-E was designed as a "broad guage" instrument to sample from a wide variety of life situations, such as politics, government, academics, work, social and interpersonal situations. The 29 pairs of statements comprising the I-E were described by Rotter (1966) as dealing "exclusively with the subjects' beliefs about the nature of the world. That is, they are concerned with the subjects' expectations about how reinforcement is controlled. Consequently, the test is considered to be a measure of a generalized expectancy" (p.10). As the scale is forced-choice in format, subjects select from a pair of statements the one which is more reflective of their beliefs. If an individual attributes an event to luck or powerful others, then the belief is classified as external LOC. Contrarily, if an event is attributed to personal ability, then the belief is classified as internalLOC. Internal LOC statements are paired with external LOC statements, with one point given for each external LOC statement selected. For instance, item #2 of the I-E reads: "(a) Many of the unhappy things in people's lives are partly due to bad luck, and (b) People's misfortunes result from the mistakes they make" (Rotter, 1966, p. 11). In this example, statement (a) depicts external LOC and statement (b) depicts internal LOC.

Six of the 29 paired statements are buffer or filler items which Rotter (1966) included in an attempt to make the purpose of the test less obvious to the test taker. No scores are given for these buffer items. Hence, the range of possible scores extends from 0 to 23. The higher the raw score, the greater the perception that reinforcements are externally controlled. In keeping with Rotter's (1966) theoretical formulation of the LOC construct, individuals scores on the I-E scale are viewed as varying along a unidimensional continuum of LOC.

Test Construction, Reliabiltiy, and Validity

In the initial monograph, Rotter (1966) presented existing normative data on the I-E scale. These norms were predominantly based on the sampling of student populations. The means, standard deviations, biserial item correlations, internals consistencies, test-retest reliabilities, and validity information from a number of investigations were presented.

Biserial item correlations of each item with the total score for the remaining items were provided by Rotter on a combined University sample of 400 and for subgroups of 200 males and 200 females. Biserial item coefficients are the standard Pearson product-moment correlation applied to data containing dichotomies (Gorsuch, 1983). For Rotter's combined group, the mean correlation was .26 with a range of .11 to .48, which Rotter considered as moderate but consistent. However, Reid and Ware (1973) considered Rotter's item-total correlations to be low, and suggestive of heterogeneity within the scale.

Reliability was measured both by the internal consistency of the test and as well by test-retest. Rotter(1966) reported measures of internal consistencies ranging from .65 to .79. The reliability over time was reported by Rotter for a one month period for three samples. The test-retest coefficients ranged between .60 and .83. In addition, a test-retest for a two-month period on a sample 117 students was reported by Rotter to be .55. Rotter considered all of these reliabilities to be adequate.

Surveys of the research literature (Joe, 1971; Lefcourt, 1976; Phares, 1976) have essentially adopted Rotter's (1966, 1975) evaluation that the reliability coefficients of the I-E scale are somewhat low but consistent. Very little attention or challenge on this psychometric shortcoming could be found in the literature. Rotter (1966, 1975) defended the low reliability on both internal consistency measures as well as test-retest measures. Firstly, Rotter (1975) argued that one would expect to obtain lower internal consistency on additive scales, such as the I-E scale, because they sample from a wide range of different situations. Secondly, Rotter (1966) argued that the low reliabilities for a two month retest may be attributed to the fact that the first test was group administered whereas the second test was individually administered.

During the early stages of the I-E development, attempts were made to construct subscales for specific areas. However, these subscales were later eliminated due to the subscale intercorrelations being nearly the same as the subscale internal reliabilities. When Rotter (1966) conducted a factor analysis of the I-E, his findings suggested that one factor was sufficient to account for the majority of the total variance. Rotter claimed these results provided empirical evidence for the unidimensionality of the I-E scale. Since the publication of this claim, the dimensionality of the I-E scale has become a topic of dispute which will be discussed in the next section on factor analytic investigations.

The validity of the I-E scale has been demonstrated chiefly through discriminant and construct methods. The I-E scale has been described as having good discriminant validity (Joe, 1971; Lefcourt, 1976; Phares, 1976), as evidenced by low correlations with such variables as political affiliation and intelligence. Moreover, the I-E scale has been utilized extensively in correlational studies researching personality differences and has also influenced intervention work in applied, academic, and clinical settings (Phares, 1976). It has been found, for instance that individuals classified as holding internal expectancies are more likely than those persons holding external expectancies to assume responsibility for their actions (Davis & Davis, 1972; Phares, Wilson, & Klyver, 1971). Other studies have found that individuals with internal expectancies are more likely than those persons holding external expectancies to be perceptually more alert and attentive in performance task situations (DuCette & Wolk, 1973; Lefcourt, Gronnerud, & McDonald, 1973), to gather and process information effectively for problem solving (DuCette & Wolk, 1972; Pines & Julian, 1972), and to undertake measures to change aversive life situations (Pawlicki & Almquist, 1973; Sanger & Alger, 1972).

A notable change in I-E scale normative data, as reflected by mean scores, has emerged over the past 20 years. The responses to the I-E scale have shifted in a more external direction. Mean scores have increased from a score of 8 (SD ± 4) to scores varying between 10 and 12 (SD ± 4), depending on the sample surveyed (Rotter, 1975). It is readily apparent that if median scores are now implemented to obtain groups, subjects once classified as holding external expectancies in the early investigations may now be labelled as holding internal expectancies.

This shift in median scores clearly underscores the importance of refraining from dividing individuals into types of either <u>internals</u> or <u>externals</u>. As Rotter (1975) has emphasized in reference to his own scale, "There is absolutely no justification for thinking in terms of a typology" (p. 62). Similarly, Levenson (1981) pointed out that "although people do speak of 'internals' and 'externals', researchers should remember that these scores distribute themselves along a continuum and what is taken as "internal" in one sample may be in the middle of the distribution in another" (p. 22).

Response Biases

An intention of Rotter (1975) and his colleagues during their creation of the I-E scale was to construct an instrument which ruled out or minimized the likelihood of social desirability occuring. With a self-report instrument like the I-E scale, the potential exists for any correlation among measures to be due to a common tendency for subjects to answer the questionnaire in such a manner as to appear socially acceptable. Rotter followed the standard procedure required to eliminate social desirability bias for any forced-choice format. This entailed initially scaling all of the statements in the questionnaire for social desirability. Following this, the next step was to pair the statements according to their closeness in scale values. Hjelle (1971) summarized that "the assumption underlying the forced-choice format is that if two statements have approximately the same social - desirability values (SDSVs), then this equality will attenuate the probability that the choice of one of the two statements will be influenced by social desirability tendencies" (p.808). Using the procedure described above, the I-E scale was reduced from a 60 -item scale to the final 23 -item scale.

The specific instrument selected by Rotter to measure the response bias of social desirability was the Marlowe - Crowne Social Desirability (MCSD) scale. The MCSD measures the need to get approval from others by presenting oneself in a favourable light (Crowne & Marlowe, 1964). Rotter (1966) reported correlations with the MCSD ranging from -.07 to -.35 for student subjects and -.41 on a prisoner sample. Subsequently, Tolor (1967) and Tolor and Jalowiec (1968) found nonsignificant negative correlations with the MCSD, whereas Feather (1967) and Altrocchi, Palmer, Hellmann, and Davis (1968) found significant negative correlations with the MCSD. Similarly, Berzins, Ross, and Cohen (1970) reported a significant negative relationship between I-E scores and scores using another social desirability scale, referred to as the Edwards Social Desirability Scale. In a review of the above mentioned empirical evidence, Joe (1971) suggested that the I-E scale is not completely free of the desireability response set.

Despite Rotter's (1966, 1975) claim that sex differences on the I-E scale among college students are minimal, some contrary evidence has been published. Among university students, Feather (1967, 1968) found that females had significantly higher external scores than males. Hochreich (1975) has demonstrated that sex-role bias may be operating as subjects respond to the I-E. Finally, Strickland and Haley (1980) found that sex differences were not evident in total scale scores, but that the patterns of responding to particular items on the I-E scale did differ for male and females. Items on which sex differences existed were most often those reflecting social/affective domains.

Response bias has also been found to occur on the I-E scale in regards to race (e.g., Gurin, Gurin, Lao, & Beattie, 1969), political ideology (e.g., MacDonald, 1972), and socio-cultural background (e.g., O'Brian & Kabanoff, 1981).

Additional Psychometric Shortcomings

Klockars and Varnum (1975) were the first investigators to challenge the assumption that the two statements within each item pair are logical opposites. When the I-E scale is in its original format, this bipolar assumption cannot be tested, because the subject must select between the two statements. To test the assumption, Klockars and Varnum revised the I-E instrument by separating all the pairs of statements, thus allowing the 367 subjects to accept or reject the 46 statements independently. Correlations between the two statements from the item pairs would give evidence regarding the unidimensionality of the pairs. If the assumption that each pair of statements represents two widely separated points along a single dimension holds true, then moderate to large negative correlations between the statements would be expected. However, Klockars and Varnum found that the average correlation between the item pairs was -.15. Only seven of the correlations exceeded -.20 which suggested to the researchers that subjects seem to respond to the statements as if they were separate and only slightly negatively related. Hence, the assumption that the item pairs are bipolar was found untenable. Based on these findings, Klockars and Varnum suggested the forced-choice format of the I-E scale be abandoned. Support for these findings has been provided in investigations by Collins (1974), Marsh and Richards (1986), and Zuckerman and Gerbasi (1977) whose results also cast considerable doubt over the bipolar assumption. Marsh and Richards concluded that "the negative relationship between internality and externality may not be sufficiently large to warrent the forced-choice format be used on the Rotter instrument" (1986, p. 526).

Summary

Rotter's (1966) I-E scale is the most extensively used LOC measurement for adults. Investigations employing the I-E instrument have predominantly been of a correlational nature. Most of the normative data of the I-E scale was derived from student samples. Adequate discriminant validity and construct valididty has been demonstrated. However, caveats have been advanced concerning some of the psychometric shortcomings of the I-E scale, such as, its low reliability; its response biases surrounding sex, social desirability, race, and sociocultural background; and the doubtfulness on the validity of the bipolarity assumption.

Factor Analytic Studies of the I-E Scale

Rotter (1966) considered his I-E scale to be unidimensional in nature. From the results of his own factor analysis, Rotter concluded that much of the variance was included in a general factor. He suggested that the additional factors, involving few items, were unrealistic and accounted for a small degree of the variance.

Since this early study by Rotter, a number of factor analytic investigations on the I-E scale have indicated the existence of at least two factors, and as such, have countered that the scale is multidimensional. These subsequent studies are summarized in Table 1. This table contains a chronological listing of 15 factor analytic investigations conducted on

TABLE 1

SUMMARY OF FACTOR ANALYTIC STUDIES ON THE I-E SCALE

INVESTIGATOR	SUBJECTS	SAMPLE SIZE	# OF FACTORS IDENTIFIED	PERCENT OF VARIANCE	LOADING CRITERIA	FACTOR SCALE COMPOSITION
Mirels (1970)	American Undergrad	M 159	M 2	M I 10.9 II 8.6 T 19.5	≥ 0.3	* M I 25,15,11,18,23,16, 5,28,4,10 (GC) M II 17,12,22,29 (PC)
		F 157	F 2	F I 12.1 II 6.7 T 18.8		F I 11,16,25,23,15,18, 28,6,5,13,10,9 (GC) F II 22,12,26,17,29 (PC)
Abrahamson, Schludermann, & Schludermann (1973)	Canadian Undergrad	M 120	M 2 or 3	M I 17.8 II 8.5 III 7.6 T 33.7	Not Given	Not Given
		F 113	F 2 or 3	F I 15.5 II 9.9 III 7.6 T 33.0		
Reid & Ware (1973)	Canadian F Dieters	F 130	F 2	US	≥ 0.3 & ≤ 0.15	* F I 6,18,25,11,4,2,21, (GC) II 22,12,17,29,13 (PC)
Cherlin & Bourque (1974)	(a) American College	(a) 161	(a) 2	(a) I 19 II 10 T 29	≥ 0.3 to ≥ 0.4	*(a) I 25,11,6,28,16,18,15, 4,10,20,23,2 (GC) II 17,22,3,12,29,9 (PC)
	(b) American Public	(b) 100	(b) 2	(b) I 16 II 9 T 25		(b) I 11,25,4,15,16,13,18, 6,20,10,2 (GC) II 3,22,17,29,12,9,7 (PC)

Note: M = male; F = female; * = descending order; GC = general control; PC = personal control; LS = leadership/success; AC = academic/career; IS = interpersonal situation.

TABLE 1 (continued)

INVESTIGATOR	SUBJECTS	SAMPLE SIZE	# OF FACTORS IDENTIFIED	PERCENT OF VARIANCE	LOADING CRITERIA	FACTOR SCALE COMPOSITION
Viney (1974)	Australian adolescents	M 159 F 134	M 2 F 2	M I 8 II 5 T 11 F I 12 II 7 T 19	≥ 0.3	M I 5,11,16,18,23,15 (GC) II 3,6,12,13,17,22,26 (PC) F I 9,11,12,13,15,16,18, 25.,28 (GC) II 3,12,16,17,22,26 (PC)
Dixon, McKee, &McRae (1976)	Canadian Undergrads	M 98 F 123	M 3 F 3	M I 14.2 II 8.5 III 5.6 T 28.3 F I 14.0 II 8.0 III 5.2 T 27.2.	≥ 0.3	* M I 12,17,22,29 (PC) II 9,2,18,26,21 (GC) III 6,7,15 (LS) F I 22,12,17,3 (PC) II 11,18,23,5,10,16,3 (AC) III 6,13,2,21 (LS)
Campbell, O'Brian, Mills, & Ramey (1977)	(a) Bl. Amer. New Mothers (b) Bl. Amer. Hi Risk New Mothers	(a) 57 (b) 51	(a) 2 (b) 4	(a) T 20.0 (b) T 29.4	Not Given	(a) I (GC) II (PC) (b) No Interpretable Structure
Little (1977)	American College	418	4 or 5	Not Given	≥ 0.30	I 9,13,15,16,28 (GC) II 3,12,17,22,29 (PC) III 5,10,23 (AC) IV 7,20,26 (IS)

TABLE 1 (continued)

INVESTIGATOR	SUBJECTS	SAMPLE SIZE	# OF FACTORS IDENTIFIED	PERCENT OF VARIANCE	LOADING CRITERIA	FACTOR SCALE COMPOSITION
Garza & Widlak (1977)	(a) American Chicano Undergrad	(a) 244	(a) 5	(a) I 12.5	≥ .025	*(a) I 25,13,28,10,18,15, 9,29 (GC)
				II 7.2		II 11,16,15,6,25 (LS)
				III 6.7		III 5,21,23,10,11 (AC)
				IV 5.4		IV 17,22,12 (PC)
				V 5.4		V 20,26 (IS)
				T 37.8		
	(b) American Anglo Undergrad	(b) 203	(b) 5	(b) I 17.6		I 25,3,28,13,15,9,4, 17,18 (GC)
				II 7.1		II 23,10,11,12,9,5 (AC)
				III 6.6		III 12,17,22,3,29 (PC)
				IV 6.0		IV 18,29,2,3,25,16,5 , 21,6,11 (L/S)
				V 5.5		V 20,26,7 (IS)
				T 42.8		
Tobacyk (1978)	Polish female University	F 199	2	F I 14.0	≥ 0.30	* I 12,17,22,3,6,21 (PC)
				II 4.7		
				T 18.7		II 23,5,10,11,13 (GC)
Strickland & Haley (1980)	American Undergrad	M 200	M 3	M I 12.0	≥ 0.30	* M I 12,17,22,29 (PC)
				II 6.0		II 26,6,18,20 (GC)
				III 4.0		III 23,10,5 (AC)
				T 22.0		
		F 200	F 2	F I 12.0		I 22,12,17,29 (PC)
				II 5.0		II 25,28,15,13 (GC)
				T 17.0		
Watson (1981)	Australian Undergrad	161	2	I 8.7	≥ 0.30	* I 25,15,18,10,4,13, 28,11,16,20 (GC)
				II 6.7		II 22,17,12,3 (PC)
				T 15.4		

TABLE 1 (continued)

INVESTIGATOR	SUBJECTS	SAMPLE SIZE	# OF FACTORS IDENTIFIED	PERCENT OF VARIANCE	LOADING CRITERIA	FACTOR SCALE COMPOSITION
O'Brian & Kabanoff (1981)	Australian General Population	1921	2	I 13.3 II 7.3 T 20.6	≥. 03 to ≥. 04	* I 22,12,17,29,3 (PC) II 10,15,13,28,5,11 (GC)
	(a) Workforce	114	2	I 13.9 II 7.4 T 21.3	"	I (PC) II (AC)
	(b) Students	177	3	I 12.9 II 8.4 III 7.3 T 20.6	"	I (success) II (PC) III (GC)
	(c) Retirees	94	3	T 27.9	"	I (PC) II (GC) III (success)
	(d) Unemployed	63	5	T 45.2	"	I (GC) II (IS) III (AC) IV ? V ?
	(e) Housewifes	203	3	T 27.6	"	I (success) II (PC) III (IS)

TABLE 1 (continued)

INVESTIGATOR	SUBJECTS	SAMPLE SIZE	# OF FACTORS IDENTIFIED	PERCENT OF VARIANCE	LOADING CRITERIA	FACTOR SCALE COMPOSITION
Lange & Tiggemann (1981)	Australian Undergrad	277	2	I 15.6 II 7.8 T 23.4	≥ .04	* I 25,18,11,15,16,9, 13,28,5 (GC) II 17,22,12,3,29 (PC)
Blau (1984)	American Undergrad	497	4	T 38.0	≥ .03	I (chance) II (fairnesss) III (PC) IV (IS)

Rotter's original 23 -item I-E scale. The studies were located in an extensive literature search, and, to the best of this author's knowledge, represent all of the available published studies. As the table was devised for comparison purposes of only the original I-E measurement, any factor analytic studies on revised versions of the I-E scale or other LOC scales are not included. Omitting studies employing revised I-E scales ruled out the possibility that any discrepancies among findings were due to a contextual effect created by the presence or absence of additional LOC items.

Number of Factors

The controversy surrounding the dimensionality of the I-E was triggered by Mirel's (1970) factor analysis of 159 male and 157 female undergraduates. Factors were extracted by the principal components method which were then rotated to orthogonal simple structure by means of the varimax solution. Mirels (1970) found two separate and meaningful factors. The first factor was characterized as a belief concerning mastery over the course of one's life. The items contrasted the person's belief in the efficiency of his own effort to influence life and the controlling role of external forces. The second factor reflected the opinions that respondents had about the control an individual might have in political affairs. In contrast to Factor I, most of the items in Factor II did not contain an alternative which employed the role of luck.

As can be seen from Table 1, the number of meaningful factors extracted by investigators ranged from two to five. Ten factor analytic investigations (Abrahamson et al., 1973; Campbell, O'Brian, Mills, & Ramey, 1977; Cherlin & Bourque, 1974; Lange & Tiggemann, 1981; O'Brian & Kabanoff, 1981; Reid & Ware, 1973; Strickland & Haley, 1980; Tobacyk, 1978; Viney, 1974; Watson, 1981) closely resemble Mirel's two factor solution, in which one factor depicts a theme of political control and the other factor described a theme of general or personal control. If one examines the table under the subheading of factor scale composition, it is readily observable that the specific items comprising the general scale differ markedly across studies, whereas the specific items comprising the political scale show more agreement across studies.

Of the four studies extracting more than two interpretable subscales, those by Dixon, McKee, and McRae (1976) and Garza and Widlak (1977) yielded a factor reflecting control of leadership success . However, similar to the general factor, items comprising the leadership/success subscale vary across studies. A subscale reflecting academic and career environments was extracted in four studies (Dixon et al., 1976; Garza & Widlak, 1977; Little, 1977; Strickland & Haley, 1980), in which consistent overlap on factor item composition is evident. Finally, a factor concerned with reactions to a person in interpersonal situations was found in four samples (Blau, 1984; Garza & Widlak, 1977; Little, 1977; O'Brian & Kabanoff, 1981), in which agreement on subscale composition is evident on the two studies which listed the specific test items.

Samples

Clearly, the majority of these factor studies have used college or university students as samples. As such, the generalizability of these studies to other sample populations, such as the general public, must still be made with caution. Of the college samples, Table 1 shows that five samples have been on American students (Blau, 1984; Cherlin & Bourque, 1974; Garza & Widlak, 1977; Mirels, 1970; Strickland & Haley, 1980), three samples have been on Australian students (Lange & Tiggemann, 1981; O'Brian & Kabanoff, 1981; Watson, 1981), two samples have been on Canadian students (Abrahamson et al., 1973; Dixon et al., 1976) and one study has sampled a group of Polish students (Tobacyk, 1978). Generally, a similar pattern of dimensionality is exhibited among various nationalities of college students.

Studies by O'Brian and Kabanoff (1981) and Cherlin and Bourque (1974) have been the only ones to factor analyse the original I-E on the public sector. Factor analyzing a random sample of 1921 individuals from the Australian general population, O'Brian and

Kabanoff (1981) extracted two factors analogous to those found by most other investigators (e.g., Mirels, 1970; Cherlin & Bourque, 1974; Lange & Tiggemann, 1981). In addition, O'Brian and Kabanoff divided their sample into five subsamples of employees, students, housewives, unemployed and retirees. More than one subscale was extracted in all five subsamples. Based on the finding that five of the six subscale factor analyses yielded a political control factor, O'Brian and Kabanoff suggested that this factor appears to be the only one which transpires for a general adult and young adult (student) population and also for most subsamples of the population. Cherlin and Bourque were interested in ascertaining the utility of the I-E scale in an adult general population as well as a college age sample. Their results indicated that both college and non-college samples exhibit two factor structures referred to as general and political control.

The factor structure of the I-E has not been investigated on young children, however, one study has been conducted on adolescents. Viney (1974) factor analyzed 159 male and 134 female Australian adolescents and found both samples fit a two-factor structure, results that are congruent with those of most other studies. Two remaining studies which factor analyzed the I-E scale with samples other than collegiate were by Reid and Ware (1973) and Campbell et al. (1977). The common finding of a two factor solution encompassing political and general control was found both in Reid and Ware's sample of female dieters and Campbell et al's. black young mothers. Campbell et al's second sample of high-risk black young mothers failed to exhibit any interpretable factor structure. Because of this finding they questioned the applicability of I-E scores on general and political factors with lower class black females. Campbell et al. did not comment on their small size of their second sample (N=51) which may have contributed to the uninterpretable factor structure.

<u>Sex</u>

5 of the 15 factor analytic studies of the I-E scale have analyzed and reported on the

pattern of response by sex. Of these studies, four found either no differences or slight discrepancies between males and females (Abrahamson et al., 1973; Dixon et al., 1976; Mirels, 1970; Viney, 1974). In their American sample of college students, Cherlin and Bourque (1974) conducted separate analyses on males and females, but reported only the combined analysis because the factor structures were very similar. Analysis by sex was also carried out by Little (1977) who reported only the factor structure for the combined group. However, Little did point out that the factor structure obtained with women's responses more closely matched the predicted pattern of factors than that obtained with men's and that men did not differentiate the personal control items and control ideology items as closely.

Strickland and Haley (1980) have been the only researchers to first match male and female subjects on total scores, means, and standard deviations prior to computing an item analysis and factor analysis. Although this study's factor analysis revealed factors that were similar to those extracted in most other investigations, sex differences in responding to different items within the factors were found, most notably on the general control factor. Males and females responded significantly differently to 8 of the 23 I-E items, a difference accounting for approximately 1/3 of the total items. In spite of the finding that the items comprising the political control factor were identical across sex, females scored more frequent internal responses than males on two items. Within the general control factor, there was a total lack of agreement on items comprising this subscale among males and females. The components of the general control factor for males was related to influencing others, whereas for females the aspects of the general control factor was concerned with self-direction and future orientation. In the males, a third factor accounting for approximately 4% of the variance was extracted which concerned academic achievement.

On the basis of their findings, Strickland and Haley emphasized that simple factor structure across groups does not necessary denote that persons within these groups are responding to items in the same direction. Moreover, these researchers showed that the item analysis underscored the fact that particular groups may obtain similar scores for different reasons.

Factor Criteria

The amount of information presented on the results of these 15 factor analytic studies varied greatly. Comrey (1978) identified the failure on the part of the researcher to provide sufficient information to allow for replication as being "one of the most commonly violated rules of scientific reporting in factor analytic studies' (p.657). In order to adequately evaluate, compare and replicate factor analytic investigations, specific criteria have been recommended for researchers to follow when reporting results (Child, 1970; Comrey, 1978; Gorsuch, 1983; Rummel, 1970; Skinner, 1980). The following is a proposed checklist of criteria for reporting factor analytic results that was adapted from the recommendations of Child (1970), Comrey (1978), Rummel (1970), and Skinner (1980):

1. Provision of rationale for factor analysis
2. Description of the variables and subjects
3. Specification of the factor model
4. Specification of the criteria for deciding how many factors to extract
5. Specification of the rotation method
6. Specification of the criterion for selecting significant loadings in each factor
7. Inclusion of the correlation matrix, unrotated factor matrix and final rotated factor solution
8. Inclusion of the communalities, eigenvalues, and percent of variance

The 15 investigations listed in Table 1 will be reviewed in regards to the above criteria.

Rationale, Variables and Subjects

A survey of the 15 I-E factor studies being reviewed here revealed that all of the studies did provide a rationale for factoring, as well as an acceptable description of the variables and subjects. As can be seen in Table 1, sample size varied quite markedly across the studies, with a range of 51 (Campbell et al., 1977) to 1921 (O'Brian & Kabanoff, 1981).

One unresolved methodological issue in factor analysis concerns the subjects or observations to variables ratio. Arrindell and van der Ende (1985) noted that "despite the classical notion that an adequate sample size is crucial in helping reduce errors in correlation coefficients and hence factor loadings, that is, in helping to minimize sampling error, its recommendations in the literature are far from consistent" (p. 166). Gorsuch (1983) advanced that a good rule of thumb is to use at least five times as many subjects as there are variables, with no fewer than 100 subjects for any analysis. Comrey (1978) advocated a sample size of at least 200 to ensure stable correlation coefficients and suggested there be at least five times as many variables as the number of expected factors. Catttell (1978) recommended a ratio of three to six times as many subjects as there are variables, with a minimum of 250 subjects. Nunnally (1978), on the other hand, suggested a good rule of thumb is to use approximately 10 times as many subjects as variables and never less than 100 subjects. Similarly, Everitt (1975) recommended that ten subjects for each variable would be the ideal ratio. Moreover, he cautioned, on the basis of simulation studies, that any conclusions of any analysis conducted on data for which the number of subjects is fewer than five times the number of variables should be viewed with a certain scepticism since spuriously high correlations between measures may be obtained.

Among the 15 investigations reviewed here, 8 out of a possible 28 samples that were factor analyzed fell below the absolute minimum 5:1 ratio Everitt (1975) cautioned researchers about (Abrahamson et al., 1973; Campbell et al., 1977; Cherlin & Bourque, 1974; Dixon et al., 1976; O'Brian & Kabanoff, 1981). Two samples (Cherlin & Bourque, 1974; O'Brian & Kabanoff, 1981) fell just short of this 5:1 ratio, whereas both samples of Campbell et al. (1977) fell far below this minimum 5:1 standard, with ratios of 2.2:1 and 2.4:1.

To date, it appears that only two investigations (Barrett & Kline, 1981; Arrindell & van de Ende, 1985) have empirically tested the subjects to variables ratio or an absolute minimum of subjects on the stability of factor structures using real data. Barrett and Kline's (1981) results showed that the observation to variables ratio did not influence factor stability, but that a minimum sample size of 50 was required to yield a clear, recognizable factor pattern. The measures utilized by Barrett and Kline consisted of good "strong" variables yielding very clear factor structures and they warned that "with factors of lesser clarity, it is possible that different findings might be obtained" (p. 145). They suggested that small sample factoring should only be performed when replicating a supposed factor structure.

Using two large samples of phobic subjects, Arrindell and van der Ende's (1985) found that neither the subjects to variables ratio nor an absolute minimum of subjects had any effect on factor stability when either a principal component analysis or principal factor analysis was conducted. For the objective of establishing a given number of true factors, these investigators suggested that sample size should be related to the number of factors drawn. Stable factor solutions were obtained in their particular study when sample size was approximately 20 times the number of factors. This rule of thumb is much more lenient than, say, a subjects to variables ratio of 10:1. According to Arrindell and van der Ende's suggested criteria of sample size being 20 times the number of factors, only 2 of 28 samples in Table 1 fail to meet this recommendation (Campbell et al., 1977; O'Brian & Kabanoff, 1981).

Factor Model

Factor analysis is a generic term that subsumes distinct models which are based on different methods and principals. Two of the major models are Principal Component Analysis (PCA) and Common Factor Analysis (CFA). PCA extracts principal factors or linear combinations of observed measures which provide the "best least squares fit to the entire correlation for the maximum amount of the total correlation matrix obtainable" (Gorsuch, 1983, p.99). That is, the first factor is that combination of data scores which accounts for the most variance, the second factor is that composition of scores which accounts for the most variance after that data connected with the first factor is removed, and so on. Since PCA provides only a direct linear transformation of the raw data, no assumptions regarding the form of the data are required.

Contrarily, in CFA, the assumption is made that the variance of each item (test) is comprised of three parts: that which the item shares in common with other items in the analysis, that which is reliable yet unique to this test, and error variance (Futch, Scheirer, & Lisman, 1982). CFA assumes that hypothetical factors exist which account for the common variance in the data. While PCA simply transforms data, CFA endeavours to define hypothetical constructs. In PCA, the solution of factoring is applied to the correlation matrix with unities in the diagonals, whereas in CFA, the solution of factoring is applied to the correlation matrix with commumalities in the diagonals. Upon replacing the diagonal elements with communality estimates, the extraction procedure for CFA is identical to that of PCA (Gorsuch, 1983), and the findings are then referred to as principal axes. Although theoretically the various factor models hold different assumptions from one another, in practice they frequently produce equivalent results (Arrindell & van der Ende, 1985; Velicer, Peacock, & Jackson, 1982). In a literature survey, Velicer et al. (1982) found that PCA was utilized twice as often as PFA during the early to mid 1960's and escalated to a ratio of five to one in favor of CFA in the late 1970's.

All of the 15 studies in Table 1 specified the particular factor model employed. The majority of studies employed PCA (Abrahamson et al., 1973; Blau, 1984; Cherlin & Bourque, 1974; Dixon et al, 1976; Garza & Widlak, 1977; Lange & Tiggemann, 1981; Little, 1977; Mirels, 1970; Strickland & Haley ,1980; Viney, 1974; Watson, 1981) and the remainder utilized CFA (Campbell et al., 1977; O'Brian & Kabanoff, 1981; Reid & Ware, 1973; Tobacyk, 1978). In one study, Watson (1981) employed three methods of factor analyses including canonical factoring, principal factoring with iterations, and PCA with rotation of a selected number of components.

Number of Factors

One of the primary difficulties with factor analysis is deciding how many factors to extract for rotation (Comrey, 1978). Some of the popular practices include, (1) determining the eigenvalues greater than one, (2) a scree test which searchs for a clear discontinuation in the distribution of eigenvalues, (3) an examination of residual correlations, and (4) an examination of the interpretability of the rotated system (Gorsuch, 1983; Rummel, 1970). The criterion of eigenvalues greater than one was adopted in 7 of the 12 studies specifying the extraction method (Campbell et al., 1977; Dixon et al., 1976; Lange & Tiggemann, 1981; O'Brian & Kabanoff, 1981; Reid & Ware, 1973; Strickland & Haley, 1980; Viney, 1974. Mirels (1970) adopted a minimum eigenvalue of .8 as his criterion for factor extraction, whereas Blau (1984) utilized a scree test to produce the resulting four-factor solution.

A few studies employed more than one criterion in determining how many factors should be extracted. Rummel (1970) considers this is an acceptable practice. Watson (1981) selected factors on the basis of Armor's (1974) criterion of extracting factors until a large drop from one eigenvalue to the next is followed by slightly decreasing eigenvalues and also by the criterion of the goodness of fit test. Cherlin and Bourque (1974) identified meaningful factors according to Armor's (1974) method of examing the magnitudes of eigenvalues of the factors. In addition, these researchers also rotated slightly larger and slightly smaller subsets of factors and inspected the meaningfulness of the different rotated structures. Moreover, Cherlin and Bourque considered the reliability of factors in determining how many factors to retain. As such, they noted that one of the reasons for rejecting rotated three- and four- factor structures was because the subscales produced had inferior reliability in comparison to the two factor solution. Tobacyk's (1978) factor extraction methods were based on the eigenvalues greater than one, as well as judging whether the proportion of total variance accounting for the factor was adequate. Similarly, Dixon et al. (1976) retained factors if their eigenvalue was equal to or greater than one and if the item total variance was equal to or greater than 5%.

Type of Rotation

The unrotated factors extracted through factoring methods may or may not yield an intelligible patterning of variables. Generally speaking, rotating of the axes of the factor loading matrix is employed because it simplifies the factor structure which subsequently allows for more interpretability. In essence, the rotation is conducted in search of a better fit between the components and the original variables which commonly is referred to as the search for simple structure (Kennard, 1978). The two basic types of factor rotation are orthogonal and oblique. To rotate orthogonally, the assumption is made that the factors are uncorrelated. Hence, the angles between factors are perpendicular to each other. In an oblique rotation, the assumption that the factors are uncorrelated is not required and as such, the angles between the factors need not be perpendicular. In essence, the initial factor axes are permitted to rotate freely to best capsulize any clustering of variables.

A number of specific rotational methods are available, including quartimax, varimax, equimax, oblique and promax. For instance, quartimax focuses on simplifying the rows of a factor matrix, whereas varimax centres on simplifying the columns of a factor matrix. Rotation can be conducted on either PCA or CFA.

All 15 investigations rotated the extracted factors orthogonally according to the

Varimax criterion. In addition to an orthogonal rotation, two studies conducted an oblique rotation (Blau, 1984; Tobacyk, 1978). The oblique solution performed by Tobacyk (1978) ruled out the likelihood of factor dependency. This evidence provided the basis for Tobacyk's conclusion that the orthogonal solution provided an accurate representation of the factor structrure of the I-E scale.

Factor Item Loadings

The typical protocol in interpreting factor results is to inspect the variables that have salient loadings on the factor, consider what they have in common, and then proceed to name the factor in keeping with the common elements. A salient loading is descibed by Gorsuch (1983) as "one that is sufficiently high to assume a relationship exists between the variable and the factor. In addition, it usually means that the relationship is high enough so that the variable can aid in interpreting the factor and vice versa" (p. 208). No consensus nor clear-cut guidelines seem to exist for deciding what value constitutes a salient loading. The significance level is considered to be one criterion for defining a salient loading but even if a loading is shown to be statistically significant, the likelihood exists that it is not significant if capitalization on chance has taken place (Gorsuch, 1983). Gorsuch (1983) noted that an absolute value of .3 has been adopted by researchers as a popular minimum loading for interpretation. Armor (1974) has suggested that items be considered to load on a rotated factor if their loadings is .40 or greater and if the item has no comparable loading on another factor.

With the exception of Abrahamson et al. (1973) and Campbell et al. (1977), all of the factor studies specified the criterion for the inclusion of an item on each rotated factor. Typically, a preset factor loading score was adopted as the criterion for item inclusion. The item loading criteria that were preset by the various investigators are listed under the specific heading in Table 1. Furthermore, whenever possible the specific factors were listed in descending order of loading significance. On Table 1, whenever an asterisk preceeds the presentation of factor item numbers, it implies a descending order of factor loadings, whereas no asterisk implies the factors are in numerical order.

As can be seen from Table 1, criteria on factor loading scores ranged from .25 to .50. The factor loading score of $\geq .3$ was the most common criterion set by LOC investigators (Blau, 1984; Dixon et al., 1976; Mirels, 1970; Strickland & Haley, 1980; Reid & Ware, 1973; Tobacyk, 1978; Viney, 1974; Watson, 1981). A few investigators required criteria in addition to the factor loading score. For example, Cherlin and Bourque (1974) considered an item for inclusion if one of the two following specifications were met: (a) the item had a factor loading of .4 or greater and also had no comparable loading on another factor, or (b) the item had a factor loading of .3 or greater and met two conditions: one, the content of such item was consistent with the analytical construct dominating the factor, and two, the item increased the reliability of the factor without detering from the coherence of the factor meaning.

Factor Matrices

To evaluate the merits of a factor analysis and permit replication, a number of authors underscore the importance of making particular matrices available, either in the article itself or through auxillary publication outlets (Comrey, 1978; Rummel, 1970; Skinner, 1980). Comrey (1978) emphasized the significance of the correlation matrix being available not only for the purpose of assessing the adequacy of the solution but also to enable another the opportunity to conduct one's preferred type of analysis on the data. Rummel (1970) advocates the inclusion of the unrotated matrix as well as the final rotated factor matrix in the write up of results. Specifically, for the unrotated matrix, the communalities and percent of variance should be noted. They provide some indication of the homogeneity of test items. The communality of a variable is the total variance of a variable accounted for by the total combination of all factors . Communalities allow for interpretation of the fit of each variable to the factor space. The percent of variance calculates the strength of the relationships between variables and factors. The subjective element involved in the naming of factors underscores the importance of presenting the rotated factor matrix, as only in this way can the adequacy of factors be ascertained. Comrey (1978), Rummel (1970), and Skinner (1980) all recommend including both the structure and pattern matrices whenever an oblique solution is conducted.

None of the studies in Table 1 provided all the essential information on factor matrices. Correlation and unrotated matrices were not supplied in any of the investigations. Although all of the studies failed to report the communalities, the percent of variance was presented and these are listed in Table 1. Only 2 studies (Cherlin & Bourque, 1974; O'Brian & Kabanoff, 1981) presented the eigenvalues. With respect to the two studies performing an oblique solution (Campbell et al., 1977; Tobacyk, 1978), both failed to supply the structure matrix and only Campbell et al. (1977) presented the pattern matrix.

Upon inspection of the percent of variances listed in Table1, it appears that the amount of variance associated with the extracted factors is relatively small. For a two factor solution, the variance never exceeded 30% in all of the 15 studies. This implies that 70% or greater of the variance in test items is related to either items which are unique in content or to error variance. Even when more factors were extracted, the variance did not increase substantially. For instance, it can be seen from Table 1 that none of the three factor solutions had a total variance accounted for exceeding 35% and even four and five factor solutions failed to exceed 50% in total variance.

Internal Consistency

Internal consistency is a particular method of reliability estimation based on the amount of correlation between the items on a test, i.e., item homogeneity. The alpha coefficient has typically been considered as the preferred index of internal consistency because it has a single value for any given set of data and also because its value is equal to that of the mean of the distribution of all possible split-half coefficients related with a particular set of test data (Bruning & Klintz, 1984). In one survey of psychometric tests, Kline (1979) reported that a minimum coefficient of .7 is needed to deem the internal consistency of a test as satisfactory. This criterion is not accepted by everyone. For instance, Nunnally (1970) argues that inspite of no specific guideline existing on how high a reliability coefficient on a test should be, that generally a coefficient below .8 should be viewed with suspicion. This author noted that a number of the better-standardized measurements have reliability coefficients over .9. Moreover, he noted that what constitutes "good" reliability depends on the way a measurement is utilized. Nunnally emphasized that it is typically more essential to have high reliabilities for instruments employed in applied psychology than for instruments employed in basic research.

Few studies have attempted to ascertain the consistency with which described sub-dimensions of the I-E scale are obtained. A list of the various alpha coefficients from these I-E factor studies are listed in Table 2. The first investigators to consider the internal consistencies of the derived factor scales were Reid and Ware (1973). Using a sample of 130 female dieters, two factors on the I-E scale were found. The first factor, labelled Fatalism, measured the extent to which people believe that luck, fate, or fortune versus ability, hard work, and personal responsibility determine one's outcome. The second factor, labelled Social System Control, concerned the belief that people could influence change within the socio-political realms of their society. The fatalism factor is very similar to the general control factor and the social system control factor is congruent with the political factor labelled in other studies, such as Mirels (1970). The alpha coefficients for the fatalism dimension and the social system control dimension were .61 and .65, respectively. Corrected coefficients were calculated to provide comparisons without bias due to scale length. As can be seen from Table 2, the corrected alphas for two dimensions were .77 and .88 respectively. The correlation between these two dimensions was .18

TABLE 2

INTERNAL CONSISTENCIES OF THE I-E FACTOR ANALYTIC SCALES

INVESTIGATOR		SUBJECTS	# OF FACTOR ITEMS	ALPHA	
Abramowitz (1973)		College Students	23	Total Scale	.71
			9	General	.68
			4	Political	.61
Reid & Ware (1973)		Female dieters	23	Total Scale	.71
			5	Political	.65
			20	(corrected political)	(.88)
			11	General	.61
			20	(corrected general)	(.74)
Cherlin & Bourque (1974)	1.	College Students	23	Total Scale	.80
			12	General	.78
			6	Political	.70
	2.	General Population	23	Total Scale	.71
			7	Political	.75
			6	General	.57
Nassi & Abramowitz (1980)		University Students	23	Total Scale	.72
			9	General	73
			4	Political	.48
Lange & Tiggemann (1981)		277 Australian Undergrads	23	Total Scale	.74
			9	General	.69
			5	Political	.70
O'Brian & Kabanoff (1981)		Gen. Public	23	Total Scale	.69
		1. Workforce	23	Total Scale	.71
		2. Housewifes	23	Total Scale	.65
		3. Students	23	Total Scale	64
		4. Retirees	23	Total Scale	.69
		5. Unemployed	23	Total Scale	.64
Blau (1984)		American	23	Total Scale	.71

which indicated that the two sub-scales of the I-E scale measured essentially independent dimensions.

In an investigation conducted to clarify the dimensionality of the I-E scale as well as the utility of the LOC construct in understanding sociopolitical activity, Abramowitz (1973) derived three scores from the I-E measurement. One score was based on responses to all 23 items and the other two scores were obtained on Mirel's (1970) two subscales. Cronbach's alpha's were .72 for the overall I-E scale, .68 for Mirel's General factor and .61 for Mirel's Political factor. Abramowitz found that the two Mirel I-E subscale scores were not correlated with each other.

In investigating the dimensionality and reliability of the I-E scale, Cherlin and Bourque's (1974) findings showed that the strength of the reliabilities was affected by the population sampled. The alpha coefficients for the General and Political control factors for the college sample were 0.78 and 0.70, respectively. For the general population sample, the alpha coefficients for the General and Political control factors were 0.75 and 0.57, respectively. Based on their findings, Cherlin and Bourque suggested that college students demonstrate two distinct LOC dimensions with adequate reliability, whereas the sample from the general population demonstrated satisfactory reliability on only one dimension, that being the political subscale. Even when three additional items were added to the general control factor for the sample from the general population, the alpha reliability of the resultant nine-item scale rose to only .63. It was concluded that the consistency of the responses to the I-E scale in the sample of the adult-age general population seem to be highly dependent upon the political items which form only a small subset of the full scale. Hence, Cherlin and Bourque recommended that the I-E scale be used with caution in a general population or non- college samples.

Another investigation on the dimensionality and reliability was conducted on the I-E scale by Lange and Tiggemann (1981) using Australian students. In support of previous two-factor solution findings (e.g., Cherlin & Bourque, 1974; Mirels, 1970; O'Brian & Kabanoff, 1981), Lange and Tiggemann's factor analysis demonstrated two distinct factors concerning personal and political control. The correlation between these two factors was .23 which indicated the subscales measured essentially independent aspects of LOC. Table 2 lists the coefficient alpha as .69 for the nine general control items and .70 for the five political control items. The authors considered these internal consistencies to be acceptably high. In addition to determining the internal consistencies of the subscales, Lange and Tiggemann were also interested in ascertaining the stability of the I-E scale factor structure over time. A test-retest was conducted 26 months following the first administration on 93 of the 277 students. On retesting, eight of the nine items that loaded highly on the General control factor on the first administration loaded on the same factor on retesting. All five items comprising the political control factor loaded on the second factor on retesting. Similarly to the initial test administration, the correlation between the subscales was .23. The internal consistencies were .80 for the total scale, .79 for the general control items, and .57 for the political control items. The test-retest reliability was .61, which the authors noted was within the range of previous studies.

In a study investigating the factor stability and reliablitiy of the 1966 Rotter I-E scale and the 1972 Levenson LOC measures, Blau (1984) found only a minimal difference in reliability between the two LOC scales. The internal consistency for the total 23 item I-E scale was .71. However, Blau did not report internal consistencies on the four I-E subscales he extracted. Similarly, O'Brian and Kabanoff (1981) also failed to provide internal consistencies for the specific subscales, however, they did provide on overall reliability for the total sample and sub-samples. Table 2 lists the overall internal consistency for the total sample as .69 and a range of overall internal consistencies from .64 to .71 for the various sub-samples.

Using a university sample, Nassi and Abramowitz (1980) conducted a study to determine the reproducibility and discriminant validity of Mirel's (1970) personal and political dimensions of the I-E measurement. Internal consistency was .72 for the full 23 item I-E scale, .73 for Mirel's general control factor, and .48 for Mirel's political factor. As coefficient alpha is enhanced by scale length, the authors advanced it was noteworthy that the reliability for the general control dimension exceeded that for the full inventory. In addition, they noted that if the political dimension was hypothetically lengthened to 23 items, that it as well would surpass the overall I-E scale. Moreover, Nassi and Abramowitz concluded that the considerable heterogeneity of item content on the I-E scale is a preliminary indication of multidimensionality.

Cherlin and Bourque (1974) as well as Lange and Tiggemann (1981) discuss how their findings illustrate the proposition from psychometric theory that an adequate overall internal consistency coefficient for a scale does not establish its unidimensionality. In comparison to the range of internal consistencies of .60 to .73 presented by Rotter (1966) for a unidimensional I-E scale, all of the total scale internal consistencies presented by investigators in Table 2 either fall within or exceed Rotter's. However, most of the subscale internal consistencies are also consistent with Rotter's findings. Apart from Cherlin and Bourque's reported skepticism on the general subscale with the non-college age population, the internal consistencies on the factor subscales in other samples have been evaluated as adequate (Cherlin & Bourque, 1974; Lange & Tiggemann, 1981; Nassi & Abramowitz, 1980; Reid & Ware, 1973).

If one is to consider Nunnally's (1978) point of view that it is crucial to have high reliablities for instruments utilized in applied or clinical research, then clearly the existing evidence on the internal consistencies on either a unidimensional or multidimensional I-E scale are inadequate. In addition to the need for ascertaining the dimensionality of the I-E scale with anxiety disorders, it would seem vital to determine the internal consistency of the scale or subscales to more fully make a judgement on the utility of the measurement.

Summary

Contrary to Rotter's claim, the I-E scale does not appear to be unidimensional. The foregoing review of factor analytic investigations indicates that at least two factors are necessary to account for the total amount of variance. Most of the factor analyses have been replication studies of Mirel's work and, in keeping with this researcher's procedure, have employed the PCA with orthogonal varimax rotation to obtain the factor subscales. The two factor structure, with subscales of general control and political control, was found in the majority of studies. However, agreement has not been reached as to what specific items constitute the general control subscale.

Most of the factor analyses were performed on samples of college students. Of the four Australian investigations, three used student samples and one used a large sample of the public sector. All of these Australian studies found a two factor solution of the I-E scale. Although sex differences have generally not been found with respect to the factor solution, they have been noted with respect to the response on specific I-E scale items. Finally, of the few studies calculating the reliability of the subscales, it was claimed that the coefficients were adequate.Whether the reliabilities of the I-E subscales would be sufficient for clinical samples, which typically call for more stringent coefficient criteria, has yet to be ascertained.

ANXIETY DISORDERS

Anxiety is a complex multidimensional phenomena involving an interaction of emotions, cognitions, and actions, with occasional altered physiological needs. It is defined as a subjective experience of tension or apprehension, imposed by the real or imagined expectation to stress or danger (Kelly, 1980). The various roles of anxiety in human behavior have long been recognized by clinicians and researchers. As a survival value and as part of everyday experience, anxiety is considered both normal and essential for human existence (Tuma & Maser, 1985).

Anxiety can also be considered an abnormal emotion, and distinctions between normality/abnormality can at times be difficult to delineate. Akiskal (1985) proposed the threshold for clinical (pathological) anxiety is reached when:

1. the emotion is recurrent or persistent;
2. it is out of proportion to the situation eliciting it, or occurs in the absence of any ostensible danger;
3. the individual is paralyzed with a sense of helplessness, or unable to take appropriate action to terminate the anxiety-provoking situations;
4. psychosocial or physiologic functioning is impaired (p. 788).

Lader (1982) advocated that clinical anxiety can best be operationalized as "a need of the sufferer to seek relief from his or her anxiety" (p. 12).

The Diagnostic and Statistical Manual (DSM-III) (APA, 1980) is extensively utilized by clinicians and investigators as a classification system for mental disorders. The purpose of DSM-III is to present clear and comprehensive descriptions of diagnostic categories to promote consistency in the diagnosis, research, treatment, and communication of the various mental disorders. Anxiety disorders represents one such diagnostic classification which is subdivided into three main categories: Phobic Disorders, Anxiety States, and Post-Traumatic Stress Disorders. In this particular group of disorders, anxiety is either the predominant source of distress, as in panic disorder and generalized anxiety disorder, or anxiety occurs when a person confronts the feared object or situation, as in agoraphobia and social phobia. Epidemiology studies have estimated that between 2% to 4% of the general public have on some occasion had a DSM-III classified diagnosis of anxiety (APA, 1980).

LOCUS OF CONTROL IN ANXIETY DISORDERS

Although the majority of research on the LOC construct using the I-E scale has been conducted on a normal population, primarily college students, a growing body of LOC research is being investigated with clinical samples. Hill and Bale (1981) delineated the clinical I-E research into the following three major areas: (1) research investigating the relationship between I-E and various diagnostic categories or personality variables, (2) investigations employing the I-E scale as a treatment outcome measure, and (3) research employing the I-E scale in the process of treatment selection.

Researchers employing the I-E scale as a unidimensional measure have found that a belief in external LOC is related to maladjustment and psychopathology (Cromwell, Rosenthal, Khakow, & Zahn, 1961; Duke & Nowicki, 1973; Hersch & Schiebe, 1967; Powell & Vega, 1972; Warehime & Foulds, 1971). Similarly, when investigators employ the I-E scale as a unidimensional measure with psychiatric clinical populations, the majority of findings indicate that a belief in external LOC is positively associated with greater psychopathology or maladjustment (Camargo & Reznikoff, 1975; Distefano, Pryer, & Smith, 1971; Harrow & Ferrante, 1969; Shybut, 1968; Smith, Pryer, & Distefano, 1971).

Consistent evidence has been found that a positive correlation exists between anxiety and external LOC (Bar-Tal, Kfir, Bar-Zohar, & Chen, 1980; Bowers, 1968; Butterfield, 1964; Feather, 1967; Hountras & Scharf, 1970; Naditch, Gargan, & Michael, 1975; Nelson & Phares, 1971; Platt & Eisenman, 1968; Ray & Katahn, 1968; Tolor & Reznikoff, 1967; Watson, 1967). Conceivably, perception of lack of control over one's environment or circumstances would no doubt induce a certain amount of anxiety. In a review of the evidence concerning the relation between control and anxiety, Mandler and Watson (1966) concluded that "if the organism has some control over the onset and offset of potentially stressful stumuli, or even if it simply expects to have such control, there is likely to be anxiety or arousal" (p. 271).

In view of the above external LOC associations with anxiety, maladjustment, and psychopathology, one might predict that individuals with anxiety disorders would similarly manifest more externality. However, current research is inconsistent in supporting this premise. LOC research with a homogeneous population of anxiety disorders is still in a state of infancy, as evidenced by the paucity of published studies. A summary of all the LOC investigations with an anxiety disorder population that are available in the literature are presented chronologically in Table 3.

In a preliminary investigation, Emmelkamp and Cohen-Kettenis (1975) explored the relation between LOC orientation, depression and phobic anxiety in a sample of 99 agoraphobics and a population of 112 normal students. Using Rotter's I-E scale, the Fear Survey Schedule, the Social Anxiety Scale, and the Self-Rating Depression Scale, the intercorrelations among the scales were positive for both groups. Hence, the results suggested a significant relation between phobic anxiety and external locus of control. Moreover, the locus of control orientation of the agoraphobics was more externally oriented than the students. Consistent with these findings, Craig et al., (1984) found agoraphobics scored higher on externality than a normal non-clinical population, when using the Locus of Control of Behavior Scale.

Using an adaptation of the Multidimensional Health Locus of Control Scale, Adler and Price (1985) conducted a study to determine whether agoraphobics are more externally oriented toward their health than a normal control population, and to determine whether there is a significant difference in health LOC expectancies affiliated with the level of severity of agoraphobia. They found that the control group (N=77) scored significantly higher on internality than the agoraphobic group (N=77), but, both of these groups were more internal than external. This finding is contrary to the two aforementioned investigations which suggested agoraphobics were externally oriented. On the subscale of chance, the agoraphobic group scored significantly higher than the controls. When the results were distributed over the four levels of severity of agoraphobia, it was shown that severe agoraphobics were more oriented toward a chance health locus of control. In addition, the finding that cured agoraphobics were more internally oriented while the severe agoraphobics were more externally oriented supported the investigators hypothesis.

TABLE 3

SUMMARY OF STUDIES ON THE RELATIONSHIP BETWEEN LOCUS OF CONTROL AND ANXIETY DISORDERS

INVESTIGATOR	SAMPLE	METHODOLOGY	MEASURES	RESULTS					
Emmelkamp & Cohen-Kettenis (1975)	Agoraphobics (99) Normals (112)	Correlational		Normals			Agoraphobics		
				2	3	4	2	3	4
			1. I-E Scale	.39+	.44+	.44+	.46+	.24*	.37+
			2. Phobic Anxiety		.61+	.48+		.45+	.50+
			3. Social Anxiety			.47+			.33+
			4 Depression						
				+p ≤ .01 *p ≤ .05					
Craig, Franklin, & Andrews (1984)	1. Agoraphobics (69) 2. Nurses (53) 3. University (123) Students	Comparative	Locus of Control of Behavior	Mean	SD	Skewness of Distribution	95% Conf. Interval		
				1. 39.4	11.2	-0.11	36.7 - 42.1		
				2. 27.9	8.1	0.50	25.6 - 30.1		
				3. 28.3	8.5	0.01	26.8 - 29.8		
Adler & Price (1985)	a. Agoraphobics (77) b. Control (77)	Between Groups	Multidimensional Locus of Contol						
			Internal	b > a, t = -3.02, p ≤ .01					
			Powerful Others	b = a, t = -0.49, p ≤ .01					
			Chance	b < a, t = 2.94, p ≤ .01					

TABLE 3: (continued)

INVESTIGATOR	SAMPLE	METHODOLOGY	MEASURES	RESULTS		
Fisher & Wilson (1985)	Agoraphobic (17) Non-agoraphobic (11)	Between Groups	I-E Scale	No significant differences		
Hoehn-Saric & McLeod (1985)	Anxiety Disorders (DSM-III) (N=112)	Between Groups	Modified I-E Scale	Externals (N=56)	Internals (N=56)	
			Hamilton Anxiety Scale	23.50	21.00	ns
	Upper & Lower Halves of I-E		State-Trait Anxiety Inventory (STAI)	58.00	51.80	< .01
			Affects Behavior Scale	- 0.55	0.11	< .001
			Somatic Symptoms Scale	26.50	20.00	< .005
			Zung Scale of Depression	61.70	54.20	< .01
			Eysenck Personality Inventory			
			a) EPI Extroversion	8.70	9.90	ns
			b) EPI Neuroticism	18.30	15.00	< .001
			STAI (II)	58.70	49.60	< .001
			Clark Personal & Social Adjustment Scale	34.30	30.90	< .04
			Childhood History	8.90	7.50	ns

TABLE 3: (continued)

INVESTIGATOR	SAMPLE	METHODOLOGY	MEASURES	RESULTS
Michelson, Mavissakalian & Miminger (1985)	Agoraphobic (N=50) (DSM-III)	Experimental 2 X 2 Factorial 4 Groups: 1. Imipramine, flooding 2. Imipramine 3. Flooding 4 .Non-specific	I-E Scale Global Assessment of Severity Self-Rating of Severity Phobic Anxiety & Avoidance Subjective Unit of Discomfort	No significant differences between group on I-E Scale ($F= 1.19$; $df= 3,41$) No significant pre-post I-E score differences (pre $\overline{X} = 9.6$; post $\overline{X} = 8.8$) I-E Score: Mean SD Agoraphobics 9.59 4.06 Normals 8.30 3.90

However, these differences among the four classifications of agoraphobia were not significant. In view of the contrasting findings of other investigations (e.g., Craig et al., 1984; Emmelkamp et al., 1975), Adler and Price advanced the notion that the more internal orientation of agoraphobics in their study may be attributed to the fact that 95% of their subjects had undergone prior treatment and 61% were classified in the "mild" category, suggesting they may have been more knowlegable about their anxiety disorder and may have had a more self-directed orientation towards management of their health.

Michelson, Mavissaklian, and Meminger (1985) examined the prognostic utility of the I-E scale with 50 agoraphobics undergoing four different treatments, namely, behavioral, pharmacological, a combination of behavioral and pharmacological, and a non-specific treatment. Pre- and post- I-E scores were compared on the subjects, all of whom met the DSM-III diagnostic criteria for agoraphobia. The normative data on the agoraphobic sample (i.e., $\overline{X} = 9.59$; SD = 4.06) was found to be comparable to those obtained in other studies with subjects from a normal population (i.e., $\overline{X} = 8.3$; SD = 3.9). On the basis of these findings, the authors suggest that agoraphobics do not exhibit differential I-E dimensions, as compared to the normal population. No statistically significant changes over time in responses on the I-E scale were found, even though the patients showed noteworthy improvement in agoraphobia. On the basis of these findings, the authors suggested that the I-E instrument may lack sensitivity in differentiating improvement among the different treatments. However, the I-E scale indicated significant improvement in outcomes for external scorers over internal scorers, regardless of the treatment. This finding suggested to the authors that the I-E scale may have utility as a prognostic index of post-treatment levels of improvement, with externality being strongly associated with improvement.

In a study investigating the psychological characteristics of 17 individuals meeting the DSM-III diagnostic criteria for agoraphobia, Fisher and Wilson (1985) found no significant differences in responses on the I-E scale between agoraphobic and control subjects.

Hoehn-Saric and McLeod (1985) examined the relationship between psychopathology and LOC in 116 outpatients diagnosed as having an anxiety disorder. Of the 112 patients examined, 46% were diagnosed as having generalized anxiety disorder and 54% were diagnosed as having panic attacks according to DSM-III diagnostic criteria. The latter category included patients who developed agoraphobia in addition to panic attacks. Using the Mastery- Powerlessness Scale, a revised 18- item subset of Rotter's I-E scale, the results indicated that patients with an external LOC were more depressed, had higher levels of state anxiety, and exhibited more indecisiveness, fatigue, and agoraphobia than those with an internal LOC. Externally oriented patients also scored higher on neuroticism and trait anxiety and scored lower on social adjustment. On the basis of these findings, Heohn-Saric et al. suggested that LOC may be of importance in the formulation of therapy and prognosis in patients with anxiety disorders.

The research on the LOC construct with anxiety disorder samples is methodologically weak. For instance, only half of the investigations (i.e., Fisher & Wilson, 1985; Hoehn-Sacric & McLeod, 1985; Michelson et al., 1985) specified using standardized diagnostic criteria of the DSM-III for selection of their clinical sample. The remaining investigations failed to provide any information on diagnostic criteria or procedures. One of the six studies used a relatively small sample size (i.e., Fisher & Wilson, 1985), limiting the generalizability of its findings. Two of the six studies in Table 3 failed to include a control group and again, caution should be exercised when interpreting this data. It is also possible that the conflicting findings could be due to the use of different LOC instruments.

It is particularly noteworthy that those researchers listed in Table 3 who have employed the I-E scale with anxiety disorder subjects have done so under the assumption that the I-E measurement is unidimensional. In addition, when the I-E scale has been applied to anxiety disorder subjects to yield unidimensional scores, it has been assumed that this subpopulation will respond similarly to that of a normal population. That is, scores are interpreted on the basis of predominantly norms for college students. To date, no factor analytic studies of the I-E scale on anxiety disorder subjects could be located in the literature. Moreover, no factor analytic investigations of the I-E scale with any clinical sample could be found. Ascertaining the dimensionality of the I-E scale with a clinical sample of anxiety disorders seems crucial prior to any further research conducted in this area.

CHAPTER III

RATIONALE AND HYPOTHESES

Most of the published research on the I-E scale has focused on the correlation of LOC with various personality dimensions. The employment of the I-E scale with various clinical samples has given rise to further recommendations for the scale's utility. Frank (1976) has recommended that LOC be utilized as both a predictive and outcome measure of clinical improvement. Similarly, Cohen and Alpert (1978) have suggested that consideration of an individual's I-E score may be of assistance in planning treatment. Moreover, Michelson et al. (1985) have suggested that the I-E scale may have utility as a prognostic index.

This present study was undertaken for three specific reasons. Firstly, the results of the paucity of studies examining LOC and anxiety disorders have been equivocal. An investigation using a large sample which meets specific recognized diagnostic criteria of the DSM-III is needed to assist in clarifying the unresolved issues raised by the current literature.

Secondly, prior to proceeding with further replication, correlational or experimental research, it is mandatory to determine some of the psychometric properties of the LOC measurements with a sample of anxiety disordered individuals. This would ensure that the discrepancies among existing studies are not arising because of shortcomings in the measurement instruments. Of crucial importance is the need to ascertain the dimensionality of the I-E scale with anxiety disorders. If the assumption of unidimensionality is confirmed, then continued research of the I-E scale based on one total score would seem justified. The existing contradictions in the literature would not be attributed to inadequacies in the measurement. On the other hand, if the assumption of unidimensionality is not confirmed, a number of implications would arise. For instance, interpretation of prior I-E scale research with anxiety disorders would be jeopardized due to the nonvalidity of the test instrument.

Finally, internal consistencies of the subscales must be determined to ascertain their practical utility. If a multifactorial solution emerges, then it also would be of value to observe whether or not anxiety disorder subjects respond to the I-E according to the same factor structure as normal subjects. Normative data on LOC with anxiety disorders would allow for these factor structure comparisions.

Clearly, research is indicated to determine whether or not the I-E scale is a reliable and valid measure for an anxiety disorder population. Establishing the dimensionality and reliability of the I-E scale for this population should help clarify some of the current confusion overshadowing the existing research, and redirect future research.

On the basis of the prior research discussed in the literature review, a multifactorial solution of the I-E scale with anxiety disorders was predicted for this study. In accordance with previous factor analytic studies, a political factor and a general factor were expected to emerge.

The following hypotheses were generated and empirically tested in this research:

H 1 : That the anxiety disorder sample will exhibit a multidimensional factor structure on the I-E scale.

H 2: That the anxiety disorder sample will exhibit a factor structure on the I-E scale in accordance with a normal population.

CHAPTER IV

METHODOLOGY

This chapter outlines the methodology used to determine the factor structure of the I-E scale for an Australian sample of anxiety disorder subjects.

Subjects

The subjects of this study consisted of 260 anxiety disorder patients, of which 72 (28%) were male and 188 (72%) were female. Ages ranged from 17 to 69 years, with a mean age of 36.5 (SD = 10.8). 65% were married, 20.8% were single, 5% were divorced, 4.2% were de facto, 3.8% were widowed and 1.2% were separated. The clinical sample was comprised of 5 subgroups of DSM-III anxiety disorders. Details of these subgroups are provided below in Table 4.

Table 4

Anxiety Disorder Subgroups

DSM-III Diagnosis	Number of Subjects			Age Range	Mean Age	SD
	Male	Female	Total			
1. Agoraphobia with panic attacks	37	122	159	18 - 69	37.2	11.8
2. Panic disorder	13	26	39	17 - 53	35.1	8.5
3. Social Phobia	14	21	35	21 - 54	33.2	8.3
4. Generalized anxiety disorder	6	12	18	26 - 62	39.6	9.9
5. Simple phobia	2	7	9	20 - 51	36.5	10.8

Table 4 presents descriptive information on the distribution of age, sex, and clinical conditions in the sample. The majority of subjects (61.2%) were clinically diagnosed as agoraphobic with panic attacks. The demographic details for subjects in this study approximate demographic data from large scale surveys (e.g., Doctor, 1982). Apart from the diagnostic categories of generalized anxiety disorder and social phobia in which no demographic information on sex ratio is available, the remaining diagnoses listed in Table 4 are diagnosed more frequently in women (DSM-III, 1980). Hence, the large proportion of females in this study is quite typical of the sex ratio for referral populations of anxiety disorders.

Procedure

Anxiety disorder subjects were drawn retrospectively from medical record charts of 334 patients who were referred for treatment to the Anxiety Disorder and Agoraphobia Clinics at the Princess Alexandra and Wesley Hospitals in Brisbane, Australia between 1982 and 1987. The majority of patients were referred to the Clinic by health professionals in the Brisbane Metropolitan area.

Upon pre-treatment assessment, each patient was requested to complete the Rotter I-E scale as part of an extensive psychological test battery. This study represented one of a number of investigative studies being undertaken in the clinic on anxiety disorders. In addition to the I-E scale, the test battery was comprised of the following measures: Fear Questionnaire (Marks & Mathews, 1979); Fear Survey Schedule (Wolpe & Lange, 1964); Hostility and Direction of Hostility Personality Questionnaire (Caine & Foulds, 1967); Maudsley Personality Inventory (Eysenck, 1959); Hamilton Anxiety Scale (Hamilton, 1959); and the Hamilton Depression Scale (Hamilton, 1960). On average, it took each patient about 40 minutes to fill out all the questionnaires. This thesis concerns itself only with the data from the I-E scale.

Following completion of the test battery, each patient underwent a clinical interview and the interviewer made a clinical diagnosis according to DSM-III criteria. The clinical assessment took approximately 50 minutes to conduct on each patient. Diagnoses were later endorsed by the team of clinic staff, i.e., psychologists and psychiatrists, during case presentation meetings. For the purpose of this study, only those patients meeting the DSM-III diagnostic criteria for an anxiety disorder were included. 74 patients were excluded due to either inappropriate diagnosis (N=42) or because of inaccuracies or omissions in their responses on the I-E scale (N=32). Hence, the final anxiety disorder sample consisted of 260 patients.

Measurement

To assess internal-external LOC, Rotter's (1966) I-E scale was employed. See Appendix A for inspection of the actual questionnaire. This particular measurement was chosen in preference to other LOC measurements for two main reasons. Firstly, the I-E is the most extensively used LOC instrument for adults (e.g., Craig et al., 1984). Secondly, the majority of factor analytic investigations on LOC have utilized the I-E scale, of which four have been conducted on Australian samples.

The I-E scale measures an individual's generalized expectations about how reinforcement is controlled, that is, whether by external or internal means. It is a 29- item questionnaire with a forced-choice format. Each item consists of two statements of which the subject must select the one most reflective of their beliefs. Internal statements are paired with external statements, with one point given for each external statement selected. Instructions are provided as part of the questionnaire. Test completion time is approximately 10 to 15 minutes.

Six buffer items (i.e., items 1, 8, 14, 19, 24, & 27) are contained in the scale, for which no scores are given. Hence, the range of possible scores extends from 0 to 23. The higher the raw score, the greater the perception that reinforcements are externally controlled. On the other hand, the lower the raw score, the greater the perception that reinforcements are internally controlled.

Rotter (1966) cited internal consistencies ranging from .65 to .79 and test-retest reliabilities ranging from .49 to .83 over one to two months. Construct valididty is provided in Rotter's (1966) monograph as well as in review publications (Joe, 1971; Lefcourt, 1976; Phares, 1976).

With 260 subjects and 23 variables, the ratio of subjects to variables is approximately 11:1. This ratio meets all of the recommended criteria for the subjects to variable ratio, including the most stringent 10:1 ratio of subjects to variables suggested by Everitt (1975) and Nunnally (1978).

Data Analysis

In order to address the issues raised as the aims of this study, a number of different statistical procedures were required. All of these statistical operations were conducted through the use of the Statistical Package for the Social Sciences (Nie, Hull, Jenkins, Steinbrenner, & Bent; 1975) computer programs, including:

1. Correlation Matrix
2. Principal Components Analysis
3. Orthogonal Varimax Rotations - 'Vmaxr'
4. Oblique Varimax Rotations - 'Oblim'
5. Reliability Coefficients

Correlations

A correlation matrix was produced by SPSS. In accordance with previous research, the six buffer items were not employed in the statistical analysis. Hence, the Pearson product-moment correlations between the 23 items became the input to the proceeding analyses.

Principal Components Analysis

Principal Components analysis (PCA) was used to ascertain dimensionaltiy of the I-E scale and to determine the number of factors to be retained for rotation. As the majority of factor analytic investigations on the I-E scale have used a PCA, it seemed only logical that using this method would provide the most accurate replication. This analysis inIOlved transforming the given set of 23 I-E scale variables into a new set of composite variables or principal components that were uncorrelated (orthogonal) to each other. The SPSS PCA program determines what the best linear combination of variables is by extracting the particular combination of variables which account for more of the variance in the data as a whole than any other linear combination of variables. The first principal component extracted on the I-E scale will, therefore, be the combination of item scores which accounts for the most variance. The second principal component extracted will be the second best linear combination of item scores, under the condition that the second component is uncorrelated to the first component. In order to be orthogonal or uncorrelated to the first component, the second factor must account for that proportion of the variance not accounted for by the first factor. Each succeeding component was extracted in a similar manner, until all the variance in the data was exhausted.

The full principal components solution means that as many components as variables are generally needed. However, the full solution is rarely used because so many of the smaller components are trivial and do not replicate. The PCA procedure is applied to the correlation matrix with unities in the diagonal. In other words, a value of one is listed for each diagonal element in the matrix of intercorrelations. This means that the correlation of each variable with itself is one, and as such, all variability is accounted for.

The eigenvalues produced from the factor extraction would be the first consideration in deciding how many factors to retain for rotation. When a PCA is conducted on a matrix of intercorrelations, there is one unit of variance for each item. Eigenvalues can be interpreted as units of variance. Therefore, any component with an eigenvalue less than one accounts for less variability than a single item. As one of the principal aims of factor analysis is to reduce the number of variables, it would not be logical to retain those components which are less efficient predictors than a single item. This rationale was followed by the SPSS program, in which only those components whose eigenvalues were greater than or equal to one were retained. This criterion ensured that only factors accounting for at least the amount of the total variance of a single variable would be regarded as significant.

Varimax Rotations

In keeping with previous factor studies of the I-E scale, the components were rotated to achieve simple and meaningful factor patterns. An orthogonal rotation was performed, as the assumption that the factors were uncorrelated was adopted. A varimax criterion was also selected to maintain congruency with the procedures utilized in previous research. This varimax criterion concerns itself with simplifying the columns of a matrix which is equivalent to maximizing the sum of the squared loadings in each column. Various solutions were rotated until the most meaningful structure could be found. An oblique rotation was implemented to determine the correlation between the factors.

Factor Item Loading

Items were considered to load on a rotated factor if their loading on that factor was .4 or greater and if the item had no comparable loading on another factor (Armor, 1974).

Internal Consistency

Cronbach's alpha coefficients for the 23 items and for the separate factors were computed using SPSS. Alpha is a measure of the ratio of the amount of item covariance in a scale to the total amount of variance in the scale, with the coefficient adjusted to fall between 0 and 1.0 (Cherlin & Bourque, 1974). When the data are in dichotomous form, as with the I-E scores, the SPSS considers alpha to be equivalent to the reliability coefficient Kuder-Richardson - 20 (KR-20).

CHAPTER V

RESULTS

Principal Components Analysis

Pearson product moment correlations among the 23 items on the I-E scales comprised the correlation matrix which is available for inspection in Table 5. The PCA conducted on the correlation matrix retained eight factors for rotation. The communalities, means and standard deviations of the PCA are listed in Table 6. As can be seen from this table, some communalities are quite high. With the exception of item four (R04) which had a communality of .38, all of the communality values were above .4. These relatively high communality values indicated the variables seem sufficiently defined by the factor solution, which reflects the adequacy of the model.

Table 7 presents the eigenvalues, the percent of variance, and the cumulative percent of variance for the 23 components in the unrotated PCA. The table shows that eight components have eigenvalues over one and account for a total of 56.6% of the variance. The eight factor solution seemed to represent the minimum dimensionality to account sufficiently for the I-E scale variance. The unrotated factor matrix for the eight component solution is presented in Table 8.

Rotation

Following the extraction procedure, orthogonal rotation was performed using the program *vmaxr*. Orthogonal varimax rotation of the eight factor structure is presented in Table 9. This solution lacked conceptual clarity in that there was a tendency for the smaller factors to contain items that loaded on previous factors, and also because the smaller factors were difficult to interpret meaningfully. When an item loads on more than one factor, the meaning of that item is no longer simple, implying it is measuring more than one theoretical dimension (SPSS, 1975). Consequently, two, three, and four factors were rotated in subsequent analyses. Separate PCA on two-, three-, four-, and eight- factors accounted for approximately 23.5%, 30.6%, 36.8%, and 56.6% of the total variance, respectively. None of these solutions accounted for very much of the variance, suggesting that a large degree of randomness exists in the data. Moreover, if the eight factor solution which accounted for the most total variance had been retained, it would have been at the cost of explanatory potential among the factors, since each factor would have had loadings only on a small number of items.

It was found that the two factor structure resulted in the most interpretable factor solution. In addition, the rotated three- and four-factor structures produced subscales with inferior reliability to those from the two factor solution, which was also a consideration in the selection of the optimal number of factors. As noted above, this solution accounted for 23.5% of the total variance.The rotated matrix for the two factor structure is presented in Table 10. Communalities for the two factor solution are also presented in Table 10.

An oblique rotation was performed on the two factor structure using the SPSS program of *oblim* . The pattern matrix and the structure matrix from this oblique rotation is presented in Table 11. The correlation between the two factors was -.19, indicating no evidence of factor dependency. Thus, it was concluded that the orthogonal solution could provide an accurate representation of the factor structure of the I-E scale in this particular sample.

Table 12 and 13 present the items that have salient loadings on the two subscales of the two-factor solution. Items comprising each factor are listed in descending order of importance of loading. Only the external item of the variable pair is listed. Using the criteria of .4, it can be observed that none of the variables loaded on more than one factor. Therefore, the factorial complexity of these variables is one. A two factor solution before rotation accounted for 15.3% and 8.2% of the total variance. After rotation, the first rotated factor no longer necessarily accounts for maximal amounts of variance, although the system as a whole accounts for the same variance as before.

Factor Descriptions

As can be seen by Table 12, Factor I was defined by Items 22, 17, 12, 29, and 3. These five items of the I-E scale concern themselves with the amount of control an individual might be expected to have over political and world affairs. In conjunction with prior labels, this factor will be referred to as **political control.**

Factor II was defined by Items 16, 15, 25, 11, 4, 23, and 7. As can be seen from Table 13, Factor II seems to be a general reflection of a person's expectancy of the degree to which their own actions, plus the actions of others, influences the course of personal events. These seven items reflect the extent to which an individual assigns greater or lesser importance to ability and hard work rather than fate or luck in influencing the course of events in their life.. Similar to prior studies, this second factor will be labelled as **general control.**

Eleven of the 23 variables failed to load greater than .40 on any factor.

Internal Consistencies

The internal consistencies of the total 23 item scale as well as the two subscales were computed once the two factor solution was decided upon. The full 23- item scale yielded an alpha coefficient of .72. The political control factor, Factor I, produced a reliability coefficient of .69. The general control factor or, Factor II, had a reliability coefficient of .58.

Summary

In summary, the 23 variables were reduced to a smaller set of variables using PCA with orthogonal varimax rotation. A two factor solution which explained 23.5% of the total variance was found to be the most interpretable factor structure. In accordance with most prior studies, the two factors were labelled as general control and political control.

Table 5

Correlation Matrix of the I-E Scale

Items	02	03	04	05	06	07
02	1.00					
03	.03	1.00				
04	.05	.13	1.00			
05	.04	-.08	.07	1.00		
06	.17	-.05	.18	.14	1.00	
07	.03	-.07	.14	.06	.21	1.00
09	.07	.17	.20	-.02	-.00	.08
10	-.10	.14	.17	.12	.08	-.07
11	.11	.04	.21	.07	.07	.10
12	.01	.19	.15	.03	.15	.01
13	.00	.12	.23	.09	.01	.07
15	.06	-.02	.15	.10	.09	.09
16	.15	-.06	.21	.03	.14	.21
17	.11	.20	.17	.02	.13	.05
18	.28	.16	.12	.04	.06	.01
20	.02	-.02	.15	.03	.04	.17
21	.27	.03	-.01	.04	.03	.04
22	.06	.21	.21	-.03	.02	-.09
23	.01	.05	.16	.10	.01	.12
25	.27	.05	.15	.12	.09	.00
26	.02	.20	.20	.05	.04	.17
28	.01	.07	.13	.06	.08	.03
29	.12	.13	.08	.03	.11	.04

Note. I-E Scale Buffer Items 01, 08, 14, 19, 24, 27 have been omitted.

Table 5 (continued)

Items						
09	1.00					
10	.14	1.00				
11	.09	.17	1.00			
12	.10	.15	.13	1.00		
13	.23	.22	.08	.16	1.00	
15	.24	.11	.22	.09	.26	1.00
16	.15	.07	.39	.10	.19	.22
17	.07	.09	.19	.48	.15	.13
18	.15	.03	.12	.08	.11	.15
20	-.00	-.03	.04	.06	.09	.08
21	.04	-.06	.06	-.03	-.06	.01
22	-.01	.14	.12	.38	.19	.05
23	.10	.26	.13	.01	.09	.14
25	.22	.13	.18	.04	.24	.29
26	.06	.13	.10	.12	.25	.13
28	.02	.15	.18	.16	.30	.15
29	.09	.00	-.07	.30	.18	.13

Items	16	17	18	20	21	22
16	1.00					
17	.11	1.00				
18	.09	.19	1.00			
20	.10	.01	.06	1.00		
21	.06	.01	.12	-.14	1.00	
22	.07	.40	.18	-.03	.04	1.00

Table 5 (continued)

Items	**16**	**17**	**18**	**20**	**21**	**22**
23	.21	.09	.01	.07	.00	.00
25	.17	.12	.34	.05	.12	.15
26	.10	.11	.05	1.00		
28	.21	.00	.29	.10	1.00	
29	.36	-.05	.04	.13	.07	1.00

Items	**23**	**25**	**26**	**28**	**29**
23	1.00				
25	.12	1.00			
26	.11	.05	1.00		
28	.00	.29	.00	1.00	
29	-.05	.04	.13	.07	1.00

Table 6

Communalities, Means, and Standard Deviations of the PCA

Items	Communality	Mean	Standard Deviation
02	.59	.42	.49
03	.62	.89	.31
04	.38	.65	.48
05	.61	.61	.49
06	.51	.29	.45
07	.56	.59	.49
09	.63	.51	.50
10	.62	.24	.43
11	.66	.33	.47
12	.57	.64	.48
13	.55	.48	.50
15	.53	.22	.41
16	.62	.20	.40
17	.59	.65	.48
18	.50	.69	.46
20	.60	.49	.50
21	.49	.70	.46
22	.59	.77	.42
23	.46	.15	.36
25	.64	.59	.49
26	.49	.49	.50
28	.57	.47	.50
29	.64	.46	.50

Note. I-E Scale Buffer Items 01, 08, 14, 19, 24, 27 have been omitted.

Table 7

Eigenvalues, Percent of Variances, and Cumulative Percentages of the PCA

Items	Factor	Eigenvalue	Percent of Variance	Cumulative Percentage
02	1	3.53	15.3	15.3
03	2	1.89	8.2	23.5
04	3	1.63	7.1	30.6
05	4	1.41	6.1	36.8
06	5	1.21	5.3	42.0
07	6	1.20	5.2	47.2
09	7	1.10	4.8	52.0
10	8	1.05	4.6	56.6
11	9	.98	4.2	60.8
12	10	.91	3.9	64.8
13	11	.81	3.5	68.3
15	12	.80	3.5	71.8
16	13	.77	3.4	75.1
17	14	.73	3.2	78.3
18	15	.71	3.1	81.4
20	16	.66	2.9	84.3
21	17	.62	2.7	87.0
22	18	.57	2.5	89.4
23	19	.55	2.4	91.8
25	20	.53	2.3	94.1
26	21	.47	2.0	96.1
28	22	.46	2.0	98.1
29	23	.42	1.9	100.0

Note. I-E Scale Buffer Items 01, 08, 14, 19, 24, 27 have been omitted.

Table 8

Unrotated Factor Matrix For An Eight Component Solution

Items	Factor 1	Factor 2	Factor 3	Factor 4
02	.27	.14	.68	.07
03	.30	-.38	-.07	-.26
04	.51	.14	-.19	.10
05	.17	.23	-.02	.08
06	.27	.15	.13	.49
07	.19	.38	-.07	.54
09	.37	.15	-.00	-.32
10	.36	.03	-.40	-.33
11	.44	.30	-.00	.02
12	.50	-.46	-.11	.26
13	.53	.03	-.27	-.22
15	.46	.29	-.02	-.14
16	.44	.41	.03	.21
17	.57	-.42	.04	.24
18	.42	-.01	.46	-.20
20	.15	.24	-.21	.26
21	.08	.10	.56	-.06
22	.45	-.53	.04	.03
23	.27	.33	-.27	-.09
25	.50	.25	.32	-.38
26	.37	.01	-.27	.10
28	.42	-.02	-.11	-.16
29	.40	-.47	.14	.24

Note. I-E Scale Buffer Items 01, 08, 14, 19, 24, 27 have been omitted.

Table 8 (continued)

Items	Factor 5	Factor 6	Factor 7	Factor 8
02	.08	-.26	.06	.16
03	.45	-.04	.10	.30
04	.16	- .02	.01	.17
05	-.41	.18	.56	.08
06	-.20	.13	.31	.01
07	.20	-.21	.09	-.02
09	.36	-.20	.08	-.44
10	-.05	.40	.24	.07
11	.01	.40	-.46	.07
12	-.05	.14	-.08	-.10
13	-.12	-.34	.10	-.12
15	-.13	-.16	-.01	-.41
16	.12	.19	-.35	-.21
17	.01	.14	-.10	-.05
18	.02	-.19	-.03	.18
20	-.04	-.45	-.22	.39
21	.24	.23	.18	.11
22	-.10	.12	-.14	.09
23	.25	.34	.14	.06
25	-.25	-.12	-.01	.07
26	.31	-.20	.24	.28
28	-.51	-.13	-.16	.22
29	-.00	-.19	.20	-.34

Table 9

Rotated Factor Matrix For An Eight Factor Solution

Items	Factor 1	Factor 2	Factor 3	Factor 4
02	.05	.73	.01	.11
03	.32	.24	.00	-.25
04	.19	.06	.13	.21
05	-.07	.06	.01	-.14
06	.19	.14	-.04	.11
07	-.04	.00	.14	.22
09	.02	.13	.73	.06
10	.11	-.13	.11	.05
11	.11	.11	-.03	.75
12	.74	-.09	.02	.11
13	.18	-.10	.52	-.08
15	.04	.01	.63	.24
16	.08	.08	.25	.72
17	.74	.09	.03	.16
18	.14	.59	.17	-.01
20	-.11	-.10	-.09	.11
21	-.03	.64	-.06	.05
22	.70	.10	-.07	.03
23	-.09	.00	.10	.27
25	-.03	.45	.34	.13
26	.15	.05	.10	-.13
28	.18	-.04	.03	.08
29	.655	.075	.312	-.204

Note. I-E Scale Buffer Items 01, 08, 14, 19, 24, 27 have been omitted.

Table 9 (continued)

Items	Factor 5	Factor 6	Factor 7	Factor 8
02	.09	-.03	.06	.16
03	.45	-.04	.10	.30
04	.16	-.02	.01	.17
05	-.41	.18	.56	.08
06	-.20	.13	.31	.01
07	.21	-.21	.09	-.02
09	.36	-.20	.08	-.44
10	-.05	.40	.24	.07
11	.01	.40	-.46	.07
12	-.05	.14	-.08	-.10
13	-.12	-.34	.10	-.12
15	-.13	-.16	-.01	-.41
16	.12	.19	-.35	-.21
17	.01	.14	-.10	-.05
18	.02	-.20	-.03	.18
20	-.04	-.45	-.22	.39
21	.24	.23	.18	.11
22	-.10	.12	-.14	.09
23	.25	.34	.14	.06
25	-.25	-.12	-.01	.07
26	.31	-.20	.24	.28
28	-.51	-.13	-.16	.22
29	-.00	-.17	.20	-.40

Table 10

Rotated Factor Matrix And Communalities

For A Two Factor Solution

Items	Factor 1	Factor 2	Communalities
02	.10	.28	.09
03	.48	-.06	.24
04	.26	.45	.28
05	-.04	.29	.08
06	.09	.30	.97
07	-.13	.41	.18
09	.16	.37	.16
10	.23	.27	.13
11	.11	.52	.28
12	.68	.02	.46
13	.36	.39	.28
15	.13	.53	.30
16	.03	.60	.36
17	.70	.10	.50
18	.31	.28	.17
20	-.06	.28	.08
21	-.01	.13	.02
22	.73	-.03	.53
23	-.04	.42	.18
25	.19	.53	.31
26	.26	.27	.14
28	.32	.28	.18
29	.61	-.05	.38

Note. I-E Scale Buffer Items 01, 08, 14, 19, 24, 27 have been omitted.

TABLE 11

OBLIQUE ROTATION OF A TWO FACTOR SOLUTION

	PATTERN MATRIX		STRUCTURE MATRIX	
Items	Factor I	Factor II	Factor I	Factor II
02	.28	-.05	.29	-.11
03	-.08	-.49	.01	-.48
04	.45	-.20	.48	-.28
05	.29	.09	.28	.03
06	.30	-.04	.30	-.10
07	.42	.19	.38	.11
09	.37	-.10	.38	-.17
10	.27	-.19	.30	-.24
11	.52	-.03	.53	-.13
12	-.03	-.68	.13	-.68
13	.38	-.30	.44	-.37
15	.54	-.05	.55	-.15
16	.61	.07	.60	-.05
17	.07	-.69	.20	-.70
18	.28	-.26	.33	-.32
20	.29	.11	.27	.05
21	.13	.03	.12	.02
22	-.06	-.74	.08	-.73
23	.43	.10	.41	.02
25	.53	-.11	.55	-.21
26	.26	-.22	.30	-.28
28	.27	-.28	.33	-.33
29	-.08	-.62	.04	-.61

Note. I-E Scale Buffer Items 01, 08, 14, 19, 24, 27 have been omitted.

Table 12

Items Comprising Factor 1: Political Control Factor

Item #	Loading	External Item Statement
22	.73	It is difficult for people to have much control over the things politicians do in office.
17	.70	As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.
12	.68	This world is run by the few people in power, and there is not much the little guy can do about it.
29	.61	Most of the time I can't understand why politicians behave the way they do.
3	.48	There will always be wars, no matter how hard people try to prevent them.

Table 13

Items Comprising Factor 2: General Control Factor

Item #	Loading	External Item Statement
16	.60	Who gets to be the boss often depends on who was lucky enough to be in the right place first.
15	.53	Many times we might just as well decide what to do by flipping a coin.
25	.53	Many times I feel that I have little influence over the things that happen to me.
11	.52	Getting a good job depends mainly on being in the right place at the right time.
4	.45	Unfortunately, an individuals worth often passes unrecognized no matter how hard he tries.
23	.42	Sometimes I can't understand how teachers arrive at grades they give.
7	.40	No matter how hard you try some people just don't like you.

CHAPTER VI

DISCUSSION

The primary aim of establishing the underlying factor structure of the I-E scale with a clinical sample of anxiety disorder patients has been fulfilled. The first research hypothesis which predicted that the anxiety disorder sample would exhibit a multidimensional factor structure on the I-E scale was confirmed. Similarly, the second research hypothesis which predicted that the anxiety disorder sample would exhibit a factor structure on the I-E scale in accordance with a normal population was also confirmed.

The results and discussion emerging from the data analysis which assessed the above hypotheses are examined in this chapter under the following sections:

1. Factor Structure
2. Multidimensionality: Implications of Prior Research
3. Utility of a Two Factor Solution
4. Additional Psychometric Shortcomings
5. Limitations of the Study
6. Implications for Future Research

Factor Structure

Two interpretable factors were identified from the principal component factor analysis. This two factor solution appears to be consistent with the majority of previously reported factor analytic investigations (e.g., Cherlin & Bourque, 1974; Lange & Tiggemann, 1981; Mirels, 1970; Watson, 1981). The regularly reported subscales of political control and general control were replicated.

The five items comprising Factor I, the political control factor, center on an individual's acceptance or rejection of the notion that a person can influence political and world affairs. Table 12 presents the salient external statements of Factor I. All of the internal and external statements of the political factor identify the social system rather than the individual as the target of control. Specifically, the internal statements depict people as capable of exerting some control over political and world affairs, whereas the external statements contend people are unable to exert any control over these events. A distinguishable feature of Factor I is that none of the salient items regard luck or misfortune as issues relevant to an individual's political or social effectiveness.

In marked contrast, the items comprising Factor II, the general control factor, center on an individual's tendency to assign more or less significance to ability and hard work than to luck as determinants in the course of events surrounding one's life. Table 13 presents the salient external items comprising Factor II. Each specific item of Factor II combines a statement concerning an individual's ability to control the course of one's own destiny against an opposing statement concerning luck or fate as the arbitrator of a person's destiny. In contrast to Factor I, the internal and external statements of Factor II centre on the individual as the target of control rather than the social system. Moreover, Factor II is comprised of what seem to be more general and wide - ranging aspects of control, while Factor I appears to be much more specific in context.

No overlap of salient items comprising Factor I and Factor II occurred at a .4 item selection criterion. 11 of the 23 I-E items failed to load saliently on either factor. The contribution of these particular items to the I-E scale is hence unclear. This represents a large void when one is mindful that these nonsalient items constitute nearly half of the total I-E items. Clearly, if researchers decide to utilize the I-E scale in future multifactorial research, the contribution of nonsalient items to the I-E scale would need to be resolved.

Multidimensionality: Implications of Prior Research

The results of this study are inconsistent with Rotter's (1966) assumption of unidimensionality. Subsequently, one implication of the findings is that the I-E scale should not be considered as unidimensional but rather as multidimensional. A similar conclusion has been arrived at by many other investigators who produced multifactorial findings of the I-E scale (e.g., Cherlin & Bourque, 1974; Dixon et al., 1976; Lange & Tiggemann, 1981; O'Brian & Kabenoff, 1981).

The consistent finding of multidimensionality on the I-E scale clearly has ramifications for prior research which adopted the unidimensional position and, accordingly, utilized a global score. Serious doubt should be cast on the interpretation of the results of these previous investigations. When previous researchers used a total I-E scale score they in essence were combining variation on two separate and independent components of locus of control. One possible consequence may have been an unknowing obscurement of meaningful results. Or, contrarily, another possible consequence may have been an unwitting presentation of invalid findings. Lange and Tiggemann (1981) underscored this latter consequence in their conclusion that a single total I-E score may not accurately reflect the beliefs of the person in every life situation and that incorporation of its use may result in significant errors of prediction. Moreover, Gurin, Gurin, and Morrison (1978) identified the likelihood of a total I-E score distorting or inhibiting understanding of the locus of control construct as a critical issue facing researchers.

The above described caveats over the utilization of a global scale score would pertain to all populations sampled. Hence, one possible explanation for the current ambiguous findings of the LOC construct with anxiety disorders may rest on the use of a global I-E score. Moreover, until personality correlates of the LOC construct with anxiety disorders can be determined separately for the two factor solution, the significance of any current relationships described in the literature should remain ambiguous. At present it cannot be ascertained which factor is responsible for any obtained relationship and therefore any future use of the I-E scale with anxiety disorders warrants caution.

Utility of a Two Factor Solution

It would seem logical that if the I-E scale is to have any practical utility as a multidimensional measure, that firstly the factors would need to be demonstrated as clearly identifiable. On the basis of their multifactorial findings, Cherlin and Bourque (1974) recommended that future research should construct separate factor scales for each meaningful factor. In addition, they drew attention to the requirement for investigators to report the loadings of each item on each factor. This process enables investigators to determine factor scores which can be derived by summing the scores on items that load highly on the same factor (Tabachnick & Fidell, 1983).

Factor Composition and Item Loadings

The feasibility of the suggestion to formulate subscale scores seems questionable considering the current lack of consensus of specific items loading on subscales and the marked differences in item loadings across studies. Although the five specific items comprising the political control factor of this study were relatively comparable to other political factors produced in the previous investigations outlined in Table 1, the same can not be said about the general control factor. When the items comprising Factor II or the general control factor of this present study were compared with those of other general control factors listed in Table 1, less agreement on the specific items comprising this subscale existed. In fact, Factor II showed no item comparability whatsoever with two such samples in Table 1 (Dixon et al., 1976; Strickland & Haley, 1980), and were only comparable with regard to the overall theme of the factor. The general control subscales listed in Table 1 which appear to most closely resemble the general control factor of this study are those identified by Cherlin and Bourque (1974), Lange and Tiggemann (1981), Mirels (1970), and Watson (1981). Of note, Lange and Tiggemann and Watson both investigated Australian samples. In light of this study's findings plus those of previous investigations, it would seem that until such time the item loadings on the subscales can be replicated adequately, the utilization of factor scores would be of little practical value.

Percent of Variance

One of the most striking observations of this study is that the two factor solution accounts for only 23.5% of the total variance. The importance of the two factors in the solution is ascertained by the percent of total variance they represent. This small proportion of the total variance is in keeping with previous studies and implies that the I-E scale contains a large segment of item specific variance that a generalized construct cannot account for (Dixon et al., 1976). Thus, although the I-E scale appears to be multidimensional, it fails to exhibit a clean factorial structure. A similar conclusion was arrived at by O'Brian and Kabanoff (1981) on the basis of their finding of a two factor solution which accounted for only 20% of the total variance for a sample of 1921 Australians drawn from the public sector. These investigators contented that there is an urgent need for both the I-E scale and the underlying LOC construct to be clarified and afforded more precise definition.

Internal Consistencies

In attempting to assess the utility of the multidimensionality of the I-E scale, examination of the internal consistencies of the subscales can offer added insight. The internal consistency of the political control factor was .69. One can see from viewing Table 2, that this reliability coefficient is within the range (i.e., .48 - .75) of previous studies. Similarly, the reliability coefficient of the general control subscale of this present study was .58 which is within the range (i.e., .57 - .78) of previous studies. In addition, the total I-E scale reliability coefficient was .72 which also is within the range (i.e., .69 - .80) of the previous studies. Despite the internal consistencies of this study being congruent to those of previous investigations, it does not imply adequate reliability. Taking into account the clinical nature of this investigation's sample, it would seem manditory to adopt Nunnally's (1978) criterion of .80 or greater as indicative of adequate reliability. Clearly, the reliability coefficients of the two subscales in this present study fail to meet this criterion. With regard to this study, a low alpha coefficient would mean that the individual items on the I-E scale were not producing similar patterns of response among anxiety disorder subjects. Therefore, this low coefficient implies that the item intercorrelations are low and that the items are relatively heterogeneous (Bruning & Klintz, 1984). As a result, performance on any one item on a particular I-E subscale is not a good predictor of performance on any other item on that same subscale. In view of the findings presented here for an anxiety disorder sample, it seems apparent that the I-E scale produces subscales which are not reliable measurements. The failure for this instrument or any other psychometric measure to demonstrate reliability, discounts the validity of a measure.

Summary

To encapsulate, it seems evident that responses to the I-E instrument for a clinical sample of anxiety disorders are multidimensional, but that the practical utililty of the separate factors are not demonstrated due to the following observations: (1) the two factors account for only a small proportion of the total variance, and (2) the two factors are not measured with sufficient reliability. Furthermore, the results of this study and previous ones have failed to establish adequate item comparability across studies nor adequate item loading replication on the subscales, both of which are necessary precursors for the development of factor scores which in turn could be utilized for much needed prediction studies. Rotter (1975) contended that factors derived from the I-E scale may exhibit utility " if it can be demonstrated that reliable and logical predictions can be made from the subscales to specific behaviors and that a particular subscale score produces a *significantly higher relationship than that of the score to the test* " (p. 63, italics original). Clearly, this demonstration recommended by Rotter has yet to transpire.

Additional Psychometric Shortcomings

With the finding that the I-E scale is multidimensional, a clean factorial structure may be expected, however this was not the case in this study. Examination of some additional psychometric shortcomings arising from this factor analysis as well as those from previous I-E studies provides clarification.

Communalities

Firstly, the communalities produced in the data analysis merit attention. As previously mentioned, the communality of a variable is the total variance of a variable accounted for by the total combination of all common factors. The communalities allow for interpretation of the fit of each variable to the factor space. Although 22 of the 23 items had relatively high communalities in the unrotated eight factor PCA, the communality values dropped markedly in the two factor rotated solution. Table 10 depicted four items having values below .1 which is clearly unacceptable. Moreover, a further seven items fell in the low communality range of .1 to .2. Thus, 11 of the items had low communalities, suggesting considerable heterogeneity within the scale. A low communality on an item implies that this item has little in common with other items and hence contributes little to either a clarification or a reduction in complexity of the factor structure (Futch et al., 1982). Considering the communalities were low for nearly half of the variables suggests that the solution is degraded by specific variances and, perhaps, by some level of error variance affiliated with each observed variable. Moreover, Reid and Ware (1973) point out that "existence of the specific item variance substantially reduces the internal consistency of the scale which in turn restricts the size of predictive validity coefficients" (p. 268).

Content of the I-E Scale

Another possible explanation for the lack of a clean factor structure emerging from the analysis concerns the actual content of the I-E scale, as well as the pairing process of statements. As illuminated earlier in the literature review, the assumption that the two statements comprising each item are logical opposites of the same facet of generalized expectancy has not been confirmed upon empirical testing (Collins, 1974; Klockars & Varnum, 1975; Marsh & Richards, 1986). These findings subsequently gave rise to the investigators recommendation that a likert scale format replace the existing forced-choice format. If, on the other hand, a forced-choice format were to be retained, new item pairs would have to be constructed which would more adequately meet the empirical standards for the bipolarity assumption.

The particular facets of LOC selected by Rotter (1966) and his associates for inclusion in the I-E instrument have been challenged for not being chosen on any sound theoretical basis (Marsh & Richards, 1986). The instrument presumably rests on Rotter's theoretical notion of generalized expectancy of control that holds for a variety of spheres of experience or behaviour. However, the I-E scale has been critisized for not capturing all the major aspects of personal control (Abrahamson et al., 1973; O'Brian & Kabanoff, 1981). Moreover, some of the components of the LOC scale are represented by only a few items. As noted by O'Brian and Kabanoff (1981), the interpersonal LOC component is comprised of only three items. The failure of the I-E scale's content to adequately represent the variety of LOC facets has been offered as an explanation for the consistent finding that only one of the specific LOC components, the political factor, is identifiable (Marsh & Richards, 1986; O'Brian & Kabanoff, 1981). When Marsh and Richards (1986) examined the various item pairs of the I-E instrument in their factor analytic study, it was observed that only those pairs comprising the political control component contained two statements which unambiguously reflected the same LOC facet.

In light of the above psychometric shortcomings, it must be remembered that factor analysis is "only a tool by which existing data can be organized; if certain important components of an anlysis are omitted form the original data base, then these components cannot be subsequently represented by a factor" (Futch et al., 1982, p. 39). This point has also been emphasized by Comrey (1978) in regards to how it is related to the theoretical interpretation of factor analytic studies.

LIMITATIONS OF THE STUDY

Although this study's Australian sample had an adequate size for the purpose of factor analysis and was demographically representative for anxiety disorders, the likelihood of various response biases in the sample exists, such as socio-cultural and social desirability biases. These in turn may have contributed to the low reliability findings. To date, no other factor analyses of the LOC construct with anxiety disorders or clinical samples has been conducted. In view of this, as well as Cherlin and Bourque's (1974) finding that the strength of the reliabilities is affected by the population sampled, replication studies would be in order. Utilizing samples of different cultural backgrounds would allow for cross-cultural validation.

No sex differentiation was attempted in the analysis which could represent bias. Strickland and Haley (1980) emphasized that similar factor structure across sexes does not necessarily denote that individuals within these groups are responding to items in the same direction. A further breakdown of the analysis into male and female samples may delineate a source of the unreliability.

The Anxiety disorders in this study were categorized into various subgroups according to DSM-III criteria. Whether or not subgroups within the classification of anxiety disorders exhibit similar factor structures and reliabilities is unknown at this present time. Fundamental differences among subgroups may have been obscured alternative interpretations of the data.

The clinical sample used in the present investigation was a selected, non-randomized sample. The selection was based on inclusion of individuals who were referred to a hospital clinic and who met the DSM-III diagnosis of an anxiety disorder. This preselected population studied may not represent a non-biased sample. The inclusion of a control group in this analysis would have strengthened the generalizability of results.

One method of factor analysis, namely PCA, was selected for the purpose of comparison with previous studies. Although the use of different factoring methods tend to exhibit similar findings (Watson, 1981), a limitation of this study may be the lack of comparison of these different methods for the population studied.

Finally, the retrospective nature of this study is limiting in that unknown biases may have been introduced. Ideally, a prospective study under controlled, randomized conditions would circumvent this possibility.

The attempt of this study to define the role of LOC in an anxiety disorder population using the I-E scale as an applied psychological measurement of a clinical population may be premature. Clearly, the essential element of any applied psychological scale of measurement is its proven reliability and validity. It is only when this is ascertained that one can then proceed to use this form of measurement as a tool in investigations.

Implications for Future Research

A number of researchers have advanced that the LOC construct is multidimensional in nature (Klochars & Varnum, 1975; Lefcourt, 1976, 1981; Levenson, 1981; Paulus & Christie, 1981; Reid & Ware, 1973). Whereas some investigators have recommended revisions to the I-E scale in the hopes of strengthening the factor structure and its reliability (Abrahamson et al., 1973; Cherlin & Bourque, 1974; Collins, 1974; Klockars & Varnum, 1975; Reid & Ware, 1973), others have recommended the development of new LOC instruments, to be comprised of distinct subscales which would reliably assess situation-specific or context-specific aspects of the construct (Dixon et al., 1974; Marsh & Richards, 1986; Watson, 1981).

The factor structure of the I-E scale for an Australian clinical sample of anxiety disorders was shown in this study to have little or no practical utility. Furthermore, this study's confirmation that the I-E instrument is not unidimensional has ramifications over the validity of prior I-E studies on anxiety disorders. Consequently, our knowledge about locus of control among anxiety disorders is currently enveloped by a certain aura of ambiguity and disarray. Continued reliance on the I-E scale might seem contraindicative and possibly unethical when one contemplates the possible implications of planning treatment or assessing clinical outcome on the basis of an unreliable measuring tool.

Lefcourt (1980) cautioned that "the awareness that many measurement devices are not meant to be more than crude approximations of an individual's position with respect to a particular construct is easily lost in the pursuit of research..." (p.128). Moreover, Lefcourt noted that it is in the "leap from the demonstration of utility in nomothetic research to clinical purposes that difficulties abound" (1980, p. 128). These comments seem particularly relevant to the I-E scale whose immense popularity among researchers carries with it the potential danger of employing it prematurely in a clinical setting. As was illuminated in this study, the use of such statistical techniques as factor analysis and ascertaining a measurements reliability for a particular population can greatly reduce the hazard of inapproprite or misdirected research.

Although this investigation suggests usage of the I-E scale for anxiety disorder patients may not be appropriate, it is not meant to imply abandoning usage of the construct with this population. Social learning theory and it's derivative construct of LOC is being referred to with increasing frequency in anxiety disorders.

Clearly, development of a LOC instrument for anxiety disorders with meaningful subscales that are soundly derived from a theoretical model is needed. Moreover, LOC scales that are designed for potential use among clinical samples, such as anxiety disorders, must be proven to exhibit sound psychometric properties with reliable subscales before they are employed in the clinical setting.

The I-E scale appears to have become a tool that has been employed extensively, at times with insufficient rationale or misguided application. Kaplan (1964) postulated the

"Law of the Instrument", which simply states that if you provide a small child with a hammer, the child will discover that everything it encounters requires pounding. In conclusion, it is clear that the sledge hammer approach to the I-E scale usage be abandoned. Instead, new efforts must be directed which properly address both the tool of measurement itself and its subsequent application. This more stringent approach to the use of measurement scales will allow further research in anxiety disorder and LOC to establish both a strong theoretical and empirical foundation before their use in the clinical setting.

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