

FACTOR STRUCTURE OF THE BARRATT IMPULSIVENESS SCALE

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The purpose of the present study was to revise the Barratt Impulsiveness Scale Version 10 (BIS-10), identify the factor structure of the items among normals, and compare their scores on the revised form (BIS-11) with psychiatric inpatients and prison inmates. The scale was administered to 412 college undergraduates, 248 psychiatric inpatients, and 73 male prison inmates. Exploratory principal components analysis of the items identified six primary factors and three second-order factors. The three second-order factors were labeled Attentional Impulsiveness, Motor Impulsiveness, and Nonplanning Impulsiveness. Two of the three second-order factors identified in the BIS-11 were consistent with those proposed by Barratt (1985), but no cognitive impulsiveness component was identified per se. The results of the present study suggest that the total score of the BIS-11 is an internally consistent measure of impulsiveness and has potential clinical utility for measuring impulsiveness among selected patient and inmate populations.

The Barratt Impulsiveness Scale (BIS; Barratt, 1959) has been revised extensively to achieve two major goals (Barratt, 1994a): (1) an early goal was to identify a set of "impulsiveness" items that was orthogonal to a set of "anxiety" items as measured by the Taylor Manifest Anxiety Scale (MAS; Taylor, 1953) or the Cattell Anxiety Scale (Cattell, 1957); (2) a later goal was to define impulsiveness within the structure of related personality traits like Eysenck's Extraversion dimension (E; Eysenck & Eysenck, 1985) or Zuckerman's Sensation-Seeking dimension, especially the disinhibition subfactor (Zuckerman, 1979).

The first goal was based on the theoretical position that the personality trait of anxiety measured "habit strength" within the Hull/Spence (Hull, 1943; Spence, 1956) learning theory as Taylor (Taylor, 1958; Taylor & Spence, 1952) had proposed and, further, that the personality trait of impulsiveness was related to the construct of "behavioral oscillation" within the same system. It was conjectured (Barratt, 1994a) that "habit strength" and "behavioral oscillation" were related to different neural systems. Thus, the early item analyses of the BIS, many of which were not published, involved laboratory research directed at finding different biological and behavioral correlates of impulsiveness and anxiety item pools. A set of impulsiveness items was identified that was factorially orthogonal to anxiety items (Barratt, 1965, 1972).

The second and major goal of the item analyses was to define more specifically impulsiveness within the broader structure of personality traits in general. As our research progressed, a number of special purpose personality scales were developed that related to impulsiveness as measured by the early forms of the BIS (Barratt & Patton, 1983). For example, Zuckerman (1979) developed a Sensation-Seeking Scale with a subscale

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of disinhibition that was correlated significantly with the BIS (Barratt & Patton, 1983). Another example is the Eysencks' (Eysenck & Eysenck, 1977) impulsiveness questionnaire. They originally had considered impulsiveness to be an integral part of extraversion (E), and we had found a significant relationship between the BIS and E (Barratt & Patton, 1983). The Eysencks later realigned impulsiveness to be part of their Psychoticism dimension (P), and the BIS then correlated significantly with the P subscale and not the E subscale of the Eysenck Personality Questionnaire among an inpatient psychiatric population (O'Boyle & Barratt, 1993).

As our laboratory, field, and clinical research of impulsiveness progressed, we concluded that there were three main impulsiveness subtraits. On an a priori basis we labeled these impulsiveness subtraits within the BIS-10 as motor (Im), cognitive (Ic), and nonplanning (Inp) (Barratt, 1985): Im was defined as acting without thinking; Ic involved making quick cognitive decisions; Inp was characterized as a "present orientation" or a lack of "futuring." In unpublished factor studies of the BIS-10 items, Im and Inp were identified, but not Ic. Others (Luengo, Carrillo-de-la-Peña, & Otero, 1991) had problems replicating Ic, although Gerbing, Ahadi, and Patton (1987) did identify cognitive factors among their 15-factor solution of 373 impulsiveness items. Im as measured by the BIS-10 appeared to be very similar to what the Eysencks had identified as impulsiveness narrow (Eysenck & Eysenck, 1977).

The purpose of the present study was to revise the BIS-10 by identifying the factor structure of the items among normals and to compare their scores on the BIS-11 with psychiatric inpatients and prison inmates. It was hypothesized that prison inmates would score higher than other groups on the BIS-11 based on their general lack of impulse control as demonstrated in a study of the "impulsivist personality" (Stanford & Barratt, 1992) and in their higher scores on the BIS-11 in the early stages of the present study (Barratt, 1994b). Psychiatry patients were hypothesized to score higher than normals, especially patients with a substance abuse disorder, which has been theorized to be an impulse control problem that involves the trait of impulsiveness (O'Boyle & Barratt, 1993).

METHOD

Subjects

The BIS-10 was administered to three groups of subjects. Group 1 consisted of 412 undergraduates (279 females, 130 males; 3 students did not identify their sex) enrolled in introductory psychology classes at Baylor University. Group 2 were 248 psychiatric inpatients who had been referred for psychodiagnostic testing at the University of Texas Medical Branch (UTMB). This group was subdivided using the discharge diagnosis into substance abuse patients and general psychiatry patients. Psychoactive substance abuse disorders were the discharge diagnoses for 164 patients (54 females, 110 males). These patients were labeled substance abuse patients. The remaining 84 (45 females, 39 males) patients had a wide range of discharge diagnoses (Mood disorders, $n = 41$; Adjustment disorders, $n = 19$; Personality disorders, $n = 12$; Thought disorders, $n = 7$; Anxiety disorders, $n = 2$; Other, $n = 3$). These patients were labeled general psychiatry patients. Group 3 consisted of 73 male inmates from a maximum security prison unit of the Texas Department of Criminal Justice (TDCJ). The inmates were recruited as part of a larger study of impulsive aggression. All subjects signed consent forms that were approved by the UTMB Internal Review Board for human research.

Barratt Impulsiveness Scale Version 10 (BIS-10)

The BIS-10 is a 34-item self-report questionnaire designed to measure impulsiveness (Barratt, 1985). All items are answered on a 4-point scale (Rarely/Never, Occasionally, Often, Almost Always/Always). Items are scored 1, 2, 3, 4; 4 indicates the most impulsive

response. The higher the summed score for all items, the higher the level of impulsiveness. To avoid a response set, selected items were worded to indicate nonimpulsiveness and were scored accordingly.

Data Analyses

Pearson's product-moment "item-total" correlations were computed with and without the item of interest included in the total score. To determine whether items differentiated extreme groups, *t*-tests were computed between item scores in the top and bottom quartiles for the total score. Items that did not have significant corrected item-total correlations ($p < .05$) and did not differentiate extreme groups were not included in further analyses. The items that met these criteria were submitted to an exploratory principal components analysis (PCA). An exploratory PCA was chosen due to the results of previous factor analytic studies (e.g., Luengo et al., 1991) of the BIS-10, which indicated that the proposed cognitive subtrait was not present. The PCA was conducted with no assumptions with regard to the number of potential factors. The number of factors to be rotated was determined by use of tables provided in Lautenschlager (1989). In accordance with Gorsuch's (1983) recommendation, the PROMAX procedure was used to obtain an oblique factor solution with the elements in the target varimax matrix raised to the third power. An oblique solution was considered appropriate because the impulsiveness subtraits were obtained from a pool of items that define the personality trait of impulsiveness per se and were not selected to be completely independent of each other. The intercorrelation matrix for the primary factors was factor analyzed to obtain higher order factors. The internal consistency of the BIS total score was based on Cronbach's alpha (Nunnally, 1978). ANOVAs were used to determine the significance of between-group differences with Scheffé's multiple comparison procedure being used to test all pairwise contrasts between groups (Kirk, 1982).

RESULTS

Factor Structure

Item-total correlations. Five items did not meet the criterion of a significant corrected item-total correlation. These five items were: 19 ("I have regular health check ups."), 26 ("I walk and move fast."), 27 ("I solve problems by trial-and-error."), 29 ("I talk fast."), and 33 ("I like puzzles."). Items 19, 26, and 27 also did not differentiate between extreme groups and were dropped from further analyses. The total score was recalculated with the remaining 31 items. Item 29 was dropped from further analyses because it was found to have a nonsignificant corrected item-total correlation with the new total score and did not differentiate between extreme scores.

Principal components analysis (PCA). The remaining 30 items were submitted to an exploratory PCA. Using tables provided by Lautenschlager (1989), six factors were retained for PROMAX rotation (Table 1).

The factor labels and definitions were: Factor 1, *attention*, "focusing on the task at hand"; factor 2, *motor impulsiveness*, "acting on the spur of the moment"; factor 3, *self-control*, "planning and thinking carefully"; factor 4, *cognitive complexity*, "enjoy challenging mental tasks"; factor 5, *perseverance*, "a consistent life style"; factor 6, *cognitive instability*, "thought insertions and racing thoughts."

Second-order factor structure. The second-order factor analysis produced three factors, each of which combined two of the primary factors (Table 2). Factor I combined first-order factors 1 (attention) and 6 (cognitive instability); this was labeled *Attentional Impulsiveness*. Factor II combined first-order factors 2 (motor impulsiveness) and 5 (perseverance); this was labeled *Motor Impulsiveness*. First-order factors 3 (self-control) and 4 (cognitive complexity) combined to form Factor III, which was labeled *Non-planning Impulsiveness*.

Table 1
Principal Components Analysis of BIS-11 Items (Oblique Rotation)

BIS-11 items	First-order factors						h^2
	1	2	3	4	5	6	
11. I "squirm" at plays or lectures.	.84	.17	-.08	-.03	.03	.02	.78
32. I am restless at the theater or lectures.	.84	.19	-.12	-.06	-.00	-.03	.76
5. I don't "pay attention."	.57	.04	.16	-.02	.27	.02	.49
9. I concentrate easily. ^a	.55	-.28	.26	.01	.12	.26	.55
21. I am a steady thinker. ^a	.45	-.04	.37	.17	-.02	-.06	.54
17. I act "on impulse."	.15	.74	.08	-.02	-.20	.06	.65
20. I act on the spur of the moment.	.12	.72	.19	-.10	-.19	.01	.65
23. I buy things on impulse.	-.08	.59	-.04	.28	.10	.11	.47
3. I make-up my mind quickly.	.11	.48	-.14	.04	.11	.06	.41
2. I do things without thinking.	.04	.42	.29	.15	.16	.06	.47
28. I spend or charge more than I earn.	.02	.37	.04	.20	.35	-.02	.38
4. I am happy-go-lucky.	.12	.32	.01	-.10	.17	.11	.21
12. I am a careful thinker. ^a	.17	-.13	.64	.17	-.18	.05	.55
1. I plan tasks carefully. ^a	-.05	.16	.64	-.04	.11	-.10	.47
8. I am self-controlled. ^a	.10	.00	.63	-.24	.08	-.17	.40
7. I plan trips well ahead of time. ^a	-.13	.17	.57	-.17	.29	.02	.50
13. I plan for job security. ^a	-.32	.06	.49	.22	.16	-.06	.43
14. I say things without thinking.	.21	.16	.45	-.00	-.17	.17	.44
15. I like to think about complex problems. ^a	.10	.06	.03	.71	-.06	-.10	.54
33. I like puzzles. ^a	-.10	-.09	-.05	.68	.01	-.06	.46
10. I save regularly. ^a	-.18	.34	.18	.46	-.07	.14	.43
31. I am more interested in the present than the future.	-.01	.16	-.12	.36	.04	.24	.21
18. I get easily bored when solving thought problems.	.29	.20	-.05	.34	.26	-.15	.36
22. I change residences.	.22	-.02	-.07	.05	.69	-.05	.51
16. I change jobs.	-.05	.06	.13	-.16	.54	.18	.39
34. I am future oriented. ^a	.03	-.11	.26	.15	.53	-.06	.42
24. I can only think about one problem at a time.	.15	-.21	-.13	.31	.38	.20	.33
30. I often have extraneous thoughts when thinking.	.12	.05	-.14	.20	-.06	.77	.68
6. I have "racing" thoughts.	.08	.18	-.05	-.21	.14	.58	.46
25. I change hobbies.	-.17	.29	-.05	-.10	.19	.35	.28
% total variance	18.3	7.6	6.5	5.3	5.1	4.5	

^aItem scored 4, 3, 2, 1.

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Table 2
Second-order Factor Structure of the BIS-11

First-order factor	Factor I	Factor II	Factor III	h^2
Factor 6	.74	– .16	.07	.55
Factor 1	.66	.02	.03	.44
Factor 5	– .30	.84	.14	.75
Factor 2	.39	.65	– .21	.67
Factor 4	.00	– .06	.91	.82
Factor 3	.39	.25	.50	.54
% total variance	28.0	18.9	17.1	

Factor intercorrelations. Pearson's product-moment correlation coefficients were calculated for each pair of subfactor scores for the Baylor undergraduates. All first-order factor scores were intercorrelated significantly from .15 to .42 ($p < .0001$). The second-order factor scores also were correlated significantly with one another from .46 to .53 ($p < .0001$). The total score was correlated significantly with all first- and second-order factor scores. Total scores on the 34-item BIS-10 and 30-item BIS-11 were correlated significantly (Baylor undergraduates: $r = .98$, $p < .0001$).

Internal consistency. Alpha coefficients for the total BIS score were within acceptable limits for use in applied studies across all groups (Table 3).

Table 3
Descriptive Statistics and Internal Consistency Coefficients for the BIS-11 Total Score

Group	Males		Females		Total group		Cronbach's alpha
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Baylor undergraduates	64.94 ^d	10.19	63.32 ^{b,c}	10.16	63.82 ^{b,c}	10.17	.82
Substance-abuse patients	69.00 ^d	10.21	69.78 ^a	10.51	69.26 ^a	10.28	.79
General psychiatric patients	69.74 ^d	11.54	72.78 ^a	13.43	71.37 ^a	12.61	.83
Prison inmates	76.30 ^{a,b,c}	11.86					.80

Note. — Baylor undergraduates (m 130, f 279); Substance-abuse patients (m 110, f 54); general psychiatry patients (m 39, f 45); prison inmates (m 73). The BIS-11 total score is the sum of the scores for each of the 30 items.

^aDiffers significantly from Baylor Undergraduates ($p < .05$).

^bDiffers significantly from Substance Abuse Patients ($p < .05$).

^cDiffers significantly from General Psychiatry Patients ($p < .05$).

^dDiffers significantly from Prison Inmates ($p < .05$).

Between-group differences. The BIS total score was significantly different among groups, $F(3,657) = 27.49, p < .0001$ (Table 3). Baylor undergraduates scored lower than both patient groups on the BIS total score. Substance abuse and general psychiatry patients did not differ significantly from one another.

Sex differences. ANOVA indicated no significant within-group sex differences. Significant within-sex differences were found between groups: males, $F(2,348) = 17.58$, $p < .0001$; females, $F(2,276) = 6.92$, $p < .0001$. Means and standard deviations by sex for all groups appear in Table 3. Scheffé mean comparisons indicated that the male

Baylor undergraduates, substance abuse patients, and general psychiatry patients scored significantly lower than male prison inmates on the BIS total score. No significant differences were found between the male patient groups and the Baylor undergraduates.

Female Baylor undergraduates scored significantly lower than both female patient groups on the BIS total score. No significant differences were found between the female patient groups.

DISCUSSION

Three second-order impulsiveness factors were identified using oblique rotations. Two of the factors, Motor Impulsiveness and Nonplanning Impulsiveness, were consistent with results of past studies (Barratt, 1985; Luengo et al., 1991). A third factor, Attentional Impulsiveness, was not consistent with Barratt's (1985) theoretical position, which postulates a "cognitive impulsiveness" factor. Luengo et al. (1991) also did not identify a "cognitive" impulsiveness factor. In the current study, cognitive items loaded on all of the factors, which suggests that cognitive processes underlie impulsiveness in general. There are several possible reasons for not identifying a cognitive impulsiveness factor per se. The first and most obvious reason would be that a cognitive impulsiveness factor does not exist, and, as noted above, "thought processes" in general underlie the personality trait of impulsiveness. It is also possible that subjects cannot independently assess thought processes that characterize impulsiveness. Past research has shown that the BIS correlates with timing and rhythm characteristics of cognition and performance (Barratt, Patton, Olsson, & Zucker, 1981; Barratt, 1983). Again, the relationship of the BIS with cognitive processes may be because the latter are characteristic of impulsiveness per se.

The first- and second-order factors in this study were intercorrelated significantly, which suggests that the item pool is a measure of the general personality trait of impulsiveness. Internal consistency for the BIS-11 total score was consistent with the results of Carrillo-de-la-Peña, Otero, and Romero (1993) and within an acceptable range for applied use. The subfactors are of primary value in helping define impulsiveness in general and exploring more subtle relationships between impulsiveness and different clinical syndromes.

No significant within-group sex differences were found. Significant within-sex differences were found between Baylor undergraduates and the patient groups. These results were in the direction that would be expected in comparing normals and psychiatric patients.

The second-order factors, Motor Impulsiveness (Factor II) and Nonplanning Impulsiveness (Factor III), are similar to the Eysencks' (Eysenck & Eysenck, 1977) impulsiveness subtraits of impulsiveness narrow and nonplanning, respectively. The BIS-11 second-order factor, Attentional Impulsiveness (Factor I), is not similar to any of the subtraits suggested by the Eysencks.

In summary, two of the three subtests of the BIS-11 are consistent with those originally hypothesized by Barratt (1985), but no "pure" cognitive impulsiveness component was evident. The BIS-11 total score was internally consistent across populations and has potential clinical utility for measuring impulsiveness among selected patient and inmate populations.

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