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PERSONALITY TRAIT ABSORPTION: AN EXPLORATORY STUDY OF OPPORTUNITY AND CAPACITY IN RELATION TO CANNABIS USE

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ABSTRACT

Although the Tellegen Absorption Scale has been widely employed in recent years as a measure of personality Trait Absorption, it is argued that this simple score does not sufficiently discriminate true capacity for Absorption nor does it reveal the level of opportunity made for absorptive experiencing. This study operationalizes Capacity and Opportunity as two additional subscales appended to the Tellegen scale and, by employing the technique of Principal Components Analysis, five useful sub-dimensions are generated. Following on from this Author's earlier suggestion that personality Trait Absorption may be linked to cannabis use and depression, an exploratory study was conducted into the relationship of cannabis use, gender, self-perceived motivation loss and depression to observed levels of overall Absorption as well as to levels of Capacity and Opportunity for absorptive experiencing.

INTRODUCTION

In recent years absorption has become increasingly popular as a psychological construct [1]. This conception of attentional deployment, now interpreted and codified as a personality trait [2-4], has found its way into research areas as diverse as aesthetics [5, 6], hypnosis [7-10], psychopathology [11], religious behavior [12, 13], altered states of consciousness [14-18], parapsychological phenomena [19-24], intelligence [25], illicit drug use [26, 27], dissociative states [28, 29] and medicine [30-32]. Individuals higher in Trait Absorption appear to manifest a fundamental need to experience the phenomenal world in a manner which totally engages attentional resources in an intrinsically self-rewarding way.

Tellegen and Atkinson describe the absorptive experience as an " 'allocentric' perceptual mode . . . involving "totality of interest," and openness to the object in all its aspects with all one's senses" [1, p. 221]. Further, this attentional style is total, "involving a full commitment of available perceptual, motoric, imaginative and ideational resources to a unified representation of the attentional object" [1, p. 274].

Irwin has argued that Absorption must be seen not only as an innate capacity for a particular mode of attentional deployment, but should be understood as comprising three sub-dimensions: "need" for absorptive experience; "opportunity" made for these experiences, as well as one's overall capacity to have such experiences [21]. He accepts that the Tellegen Absorption Scale (TAS) of the Differential Personality Questionnaire [2] is such a measure of "capacity" and he links "opportunity" to "need," which is operationalized as a slightly reworded form of the original TAS. Irwin's resultant Need for Absorption Scale (NAS) requires Ss to rate, as either "true" or "false," the assertion that they "enjoy" each of the items of the TAS rather than simply indicating whether they experience them or not. However, the connection between enjoying a particular experience and "need" for that experience remains unclear in this formulation. In addition, Irwin's approach fails to address precisely the issue of "opportunity" which, logically, only can be interpreted as the frequency of engagement in absorptive states which is not assessed in either the TAS or the NAS.

Although it is widely accepted that the TAS provides a read-out of overall "capacity" for Trait Absorption, the items, being true or false statements, fail to discriminate either the frequency of occurrence or the ease of access with which individuals experience the phenomenon of each item. In other words, when answering "true" to a given Absorption item, there is no indication made whether this experience happened once in a life-time or everyday and, further, it is not possible to ascertain whether an S finds it easy or difficult to access the phenomena represented by a given TAS item. Thus, two Absorption high-scorers may be, in fact, quite different both in their rate of absorptive participation and in their innate abilities.

Such a shortcoming suggests a need to expand the items of the TAS in order to obtain, not only a reading of simple Absorption level, but measures of both frequency (Opportunity) and ease of engagement (Capacity) as well. This article reports the results of using just such an expanded scale in an exploratory empirical study of the relationship of Trait Absorption to cannabis use and the related factors of gender, self-assessed loss of motivation and self-assessed frequency of depression.

There appears to be very little in the literature regarding these issues, but in relation to cannabis, it recently has been argued that the preference of users for the drug may be a direct consequence of the ability of the active ingredient, Δ-9-tetrahydrocannabinol, to facilitate self-rewarding absorptive and "flow" cognitive/affective states [26, 33]. It has been further suggested that the use of

cannabis may be an attempt to redress an imbalance in cognitive and affective "style" in which active, discursive, logico-deductive cognitive activities are replaced by more passive, absorptive and flow styles of attention and conscious participation. From this perspective cannabis use may reflect a means for individuals with higher levels of Trait Absorption, and who have a preference for such states, to gain greater access to this attentional mode.

It thus would seem likely that amongst regular users of cannabis a higher overall level of personality trait absorption might be observed. It has been asserted that the urge to use the drug may arise in some users from "a primary psychological need which far outweighs the power of those sorts of external pressures" [26, p. 44] which mitigate against illicit drug use. This need also may manifest itself in a preference for cannabis use in that the drug may enhance the Capacity as well as increase the Opportunity to experience states of flow and absorption. What follows is a description and analysis of an exploratory questionnaire designed to assess these issues.

METHOD

A multi-purpose questionnaire containing items for several different research projects was administered to undergraduate students at the Lismore and Coffs Harbour campuses of Southern Cross University (SCU) as well as to a few members of the surrounding community in the Northern Rivers district of New South Wales, Australia. The overwhelming majority of respondents were undergraduates (98.9%) who were taking Introductory Psychology during the period 1993-94. This psychology class serves not only the psychology major at SCU, but was, at the time, a core subject for Paralegal Studies, Human Movement Science, Business, general Social Science and Arts majors as well. Thus, the sample obtained is not dominated by psychology majors only and more closely represents the student population of SCU than do the usual collocations of undergraduates drawn from introductory psychology courses.

The first part of the questionnaire included some standard demographic items and in regard to the research being reported herein information was obtained regarding self-assessments of depression, loss of motivation for daily chores and frequency of cannabis use. The questions used for assessing cannabis intake were the same as those employed by the 1991 National Campaign Against Drug Abuse (NCADA) bi-annual national survey of Australian substance use [34]. A system for guaranteeing anonymity was employed such that no one, including the primary investigator, could ascertain the identity of respondents thus ensuring reasonably honest replies to the cannabis questions.

The last section consisted of the thirty-four item Tellegen Absorption Scale [2]. Each item of this scale requires a "true" or "false" response and if a subject answered "true" to any of these, s/he was instructed to answer two more questions appended to each of the TAS items. These two additional questions

were designed to ascertain: 1) Approximately how frequently Ss engaged in the given TAS activity (creation of Opportunity for absorptive activities); and 2) how easy is it for the respondent to do so (Capacity for engaging in these kinds of experiences). Subjects were required to circle a single number from 0-10 indicating ranges from "never" to "all the time" for Opportunity and "difficult" to "easy" for Capacity. Unlike the study by Fabian and Fishkin [27], Ss were not instructed to reference the cannabis intoxicated state when evaluating the TAS items, but to make their self-evaluations based on how they are in their usual day-to-day state.

Participation in the research was voluntary, but a 10 percent increase in a subject's final grade was offered as an incentive for taking part. As a result there was better than 99 percent participation rate for all classes surveyed.

RESULTS

A total of 272 questionnaires were returned in usable form. Of these 74.6 percent are women and 25.4 percent men with a mean age for the entire group of 24.8 years (M = 20, SD = 8.9, Range: 17-56). The mean age for women is twenty-five years (M = 20, SD = 9.2, Range: 17-56) and for men 23.9 years (M = 20, SD = 7.8, Range: 18-49), the difference being non-significant but reflecting the predominance of women amongst the mature-age students. Although there is a good representation of older students in the Southern Cross University population, 68.5 percent of the current sample is twenty-five years or younger.

The large ratio of women to men is accounted for by the fact that the largest single group of students in this study is enrolled in the Bachelor of Social Science degree (40.8%) and these students are predominantly female (81.1%). In addition, Psychology is a favored elective for those students completing the Associate Degree in Paralegal Studies (12.9% of sample) and this course of study is generally favored by women as well (91.4% in this sample). In general, where psychology is taken as an elective, it is more likely to be taken by women and in this study the students listing "Other" (other than Social Science, Business, Law, Paralegal) as their source of study are 74 percent female.

PRINCIPAL COMPONENTS ANALYSIS: OPPORTUNITY AND CAPACITY FOR ABSORPTION

For each case the total Absorption score was calculated as the sum of all the "true" responses made to the primary Tellegen Absorption items [2]. This is typically the Absorption score (TAS) reported in the literature and has a range of 0-34. In addition, the totals for all Opportunity and Capacity sub-items for each case were calculated yielding Total Absorption Opportunity (TAO) (range/0-340) and Total Absorption Capacity (TAC) (range/0-340) scores. Next, the individual items for assessing Opportunity and Capacity for Absorption were used in the

generation of two separate Principal Components Analyses (PCA). This technique was employed to ascertain the existence of any empirically-based higher order components which would be conceptually useful in addition to the three overall Absorption totals [35]. Varimax rotation was applied and Scree plots of the resultant eigen-values were made for both sets of variables [36]. Although the first eight and ten values for Opportunity and Capacity, respectively, were greater than one, there was a clear "break" in each plot at the second eigen-value, so two-component models seemed to be indicated in both cases. Although a two-component solution yielded a conceptually sound grouping for Opportunity, a three-component model appeared more conceptually appropriate in the case of Capacity and was thus adopted.

The results of the PCA for Absorption Opportunity lists the Tellegen items[1] with their respective loadings for the two rotated components which have been named "Immersed Entrancement" (Component 1—C1AO) and "Intuitive/ Imaginative Knowing" (Component 2—C2AO) and together account for almost one third of the explained variance (see Table 1). Variables with a loading coefficient of 0.320 (about 10% of variance) or greater were included in the naming process. Only variable thirteen ("If I wish I can imagine that my body is so heavy that I could not move if I wanted to") did not reach this criterion on either component, but, since it was close, was also included in the table.

Many of the loadings in the first component relate to items which ask the subject if s/he engages in acts of interoceptive or exteroceptive immersion in and entrancement by thoughts, feelings nature, sunsets, art, music, people, etc. Some of the items which load in Component 1 have synesthetic qualities as well, but it can be argued that immersion and/or entrancement is fundamental to this type of experience. Component 2 is composed of items which ask Ss whether they have imaginal and/or intuitive experiences. The former types can include episodes of entering into states in which one experiences the present as one did in childhood or states in which one can "step outside" oneself in order to experience the world differently. The latter includes sensing presences who are not veridically present, knowing what is going to be said next before hearing it, and intuiting events and meanings not yet evident to others.

Three items in this analysis appear to load fairly evenly across both components: eight, "Understanding Mystical Experiences," seven, "Absorbed in daydream," and thirty-two, "Images easily appear." In items seven and thirty-two it is not difficult to see that there are both immersion and imaginal components to these activities. But this is not as clear for item eight, which asks respondents to indicate whether or not they know what others mean when they refer to mystical experiences.

[1] Item numbers in tables 1 and 2 correspond to the Tellegen Absorption item numbers [2].

Table 1. Component Loadings for Principal Components Analysis of Absorption Opportunity Items

	Components[a]	
Rotated PCA Loadings	1	2
16–Nature/Art consc. alteration	0.6572	
34–Sunset	0.6103	
24–Organ music lift	0.6040	
23–Delight small things	0.5921	
27–Music reminds of picts or pats	0.5589	
33–Odors have colors	0.5348	
17–Colors have distinct meanings	0.5333	
15–Crackle & flames	0.5311	
12–Lost in music	0.5265	
30–Voice fascinating	0.5256	
25–Noise to music (attending)	0.5195	
2–Moved by eloquent language	0.5027	
6–See cloud shapes in sky	0.4990	
10–Textures as colors or music	0.4828	
5–Mind envelop the world	0.4513	
26–Memories from smells	0.4099	
8–Understand mystical experience	0.4064	0.3678
18–Wander off in own thoughts	0.3714	
21–Become character in play	0.3213	
19–Recollect past with clarity		0.6329
1–Experience as child		0.5963
4–Visual after-image		0.5849
31–Presence not there		0.5749
20–Make sense but not to others		0.5648
14–Presence before seen		0.5389
28–Know what is going to be said		0.5367
9–Step outside self to different state		0.4944
11–Experience as doubly real		0.4830
3–Lost in story		0.4555
29–Physical memories		0.4502
22–Thoughts as visual images		0.4141
7–Absorbed in daydream	0.3672	0.4007
32–Images easily appear	0.3540	0.3855
13–Imagine body so heavy		0.2935
Variance explained by rotated components	5.9508	5.0415
Percent of total variance explained	17.5023	14.8280

[a]Component 1 = immersed entrancement (C1AO), Component 2 = intuitive/imaginative knowing (C2AO).

The second PCA calculated for the Absorption Capacity items yielded a three component solution (see Table 2). In this case more than a third of the total variance was explained and variables loading with a coefficient of 0.370 or higher were used in naming the components. The first component is called "Exteroceptive Imaginal Entrancement" (C1AC) and includes immersion in external stimuli such as sunsets, nature, music, etc. which can contribute to imaginal experiences such as synesthesia, seeing shapes in free-form stimuli such as clouds, or "becoming" a character in a play. The second component has been labeled "Intuitive/ Extrasensory Perceptions" (C2AC) and is associated with the belief that one has precognitive perceptions, senses presences not there is a physical way, can step into a radically different reality frame and can perceive meanings where others cannot. Component 3 has been called "Interoceptive Imaginal Entrancement" (C3AC) because of its focus on introspective and reflective immersion on phenomena such as one's daydreams, inner images, memories and thoughts.

In this last PCA only two items load with approximately equal strength across more than one component. Variable number two, "Moved by eloquent language" loads significantly on both components one and three. This item appears to have two aspects in that one becomes exteroceptively immersed and/or entranced while attending to the external stimuli of someone's words while, at the same time, these stimuli may evoke associations, memories and fantasies which then become an inward part of the total immersion experience. In the case of variable eight, "I think I really know what some people mean when they talk about mystical experiences," it appears to be connected both to external stimuli (other people talking about mysticism) and to intuitively perceiving, in that the experience itself is an intuitive encounter.

Gender, Cannabis Use and Absorption

When asked whether Ss had ever tried cannabis at least once, 75 percent of the sample responded in the affirmative with the rate being only marginally higher for men that for women (see Table 3). The sample showed no statistically significant dependency between gender and ever having tried cannabis.[2] The mean age for those who had tried cannabis is 24.8 years and for those who had never tried it, 24.7 years. To the NCADA question, "When did you last use marijuana or hashish?" 51 percent responded that they were regular users and, again, there was no dependency relationship between gender and the responses to this question.[3]

It is interesting to note that almost 6 percent of those responding to the questionnaire during class time were actually intoxicated on cannabis at the time and over 8 percent had last used it the day before and were therefore likely to be showing

[2] All statistical tests reported in this paper are considered to be significant if $\alpha \leq 0.05$.

[3] This classification system is based on Australian drug research standards which classifies a 'regular' user as using once per month or more [37].

Table 2. Component Loadings for Principal Components Analysis of Absorption Capacity Items

	Components[a]		
Rotated PCA Loadings	1	2	3
34–Sunset	0.6667		
16–Nature/Art consc. alteration	0.6129		
17–Colors have distinct meanings	0.5541		
24–Organ music lift	0.5513		
27–Music reminds of picts or pats	0.5501		
33–Odors have colors	0.5368		
2–Moved by eloquent language	0.5156		0.4110
10–Textures as colors or music	0.4993		
23–Delight small things	0.4877		
30–Voice fascinating	0.4729		
12–Lost in music	0.4719		
15–Crackle & flames	0.4708		
5–Mind envelop the world	0.4643		
6–See cloud shapes in sky	0.4491		
21–Become character in play	0.4226		
11–Experience as doubly real	0.3718		
28–Know what is going to be said		0.6541	
14–Presence before seen		0.6366	
31–Presence not there		0.6073	
29–Physical memories		0.5094	
9–Step outside self to different state		0.4884	
8–Understand mystical experience	0.4196	0.4734	
20–Make sense but not to others		0.4368	
25–Noise to music (attending)		0.3871	
7–Absorbed in daydream			0.6395
32–Images easily appear			0.5812
26–Memories from smells			0.5453
19–Recollect past with clarity			0.5394
4–Visual after-image			0.5304
3–Lost in story			0.5217
18–Wander off in own thoughts			0.4783
22–Thoughts as visual images			0.4340
13–Imagine body so heavy			0.3977
1–Experience as child			0.3935
Variance explained by rotated components	5.0738	3.4882	3.7932
Percent of total variance explained	14.9229	10.2595	11.1565

[a]Component 1 = exteroceptive imaginal entrancement (C1AC), Component 2 = intuitive/extrasensory perceptions (C2AC), Component 3 = interoceptive imaginal entrancement (C3AC).

Table 3. Cross-Tabulation for Responses to "Have You Ever Tried Marijuana or Hashish?" and Gender

	Gender		
Ever Tried Cannabis?	Female	Male	Totals
Never Tried			
Count	52	16	68
Percent of row total	76.5	23.5	100
Percent of column total	25.6	23.2	25
Percent of table total	19.1	5.88	25
Tried Cannabis			
Count	151	53	204
Percent of row total	74.0	26.0	100
Percent of column total	74.4	76.8	75
Percent of table total	55.5	19.5	75
Totals			
Count	203	69	272
Percent of row total	74.6	25.4	100
Percent of column total	100	100	100
Percent of table total	74.6	25.4	100

some effects from the drug because of its relatively long half-life (5-7 days) [33]. The "try" and "use" rates reported in this study are more than twice the national averages which may be accounted for by the fact that this is not a random sample of the local population, but a student sample, and, in addition, the Northern Rivers District of New South Wales has a reputation for being the center of Australia's 'alternative' subculture. Responses also indicate that men (64.1%) are more likely to be current users of cannabis than women (46.3%).

From a combined score derived from the NCADA queries: "When did you last use marijuana or hashish?" and "During your last period of usage of marijuana or hashish, how often did you use it?" and with the addition of the question, "On the days you used marijuana or hashish, how often did you use it?" Ss were categorized as being in one of three groups: Never-Used, Past-users, or Current-Users (see Table 4) [34]. Past-Users were considered to be those who had last used marijuana or hashish more than one month ago and at that time their consumption rate was one use per month or less on average. Current-Users are those who had used within the past month or more recently and had consumed at a rate of one per month or more. Again, there was no statistically significant dependency between gender and use level when use rate was partitioned in this manner.

Table 4. Cross-Tabulation for Frequency of Cannabis Use and Gender

	Gender		
Frequency of Cannabis Use	Female	Male	Totals
Never Used			
Count	52	16	68
Percent of row total	76.5	23.5	100
Percent of column total	25.6	23.2	25
Percent of table total	19.1	5.88	25
Past User			
Count	73	18	91
Percent of row total	80.2	19.8	100
Percent of column total	36.0	26.1	33.5
Percent of table total	26.8	6.62	33.5
Current User			
Count	78	35	113
Percent of row total	69.0	31.0	100
Percent of column total	38.4	50.7	41.5
Percent of table total	28.7	12.9	41.5
Totals			
Count	203	69	272
Percent of row total	74.6	25.4	100
Percent of column total	100	100	100
Percent of table total	74.6	25.4	100

A more discriminating break-down of use was attempted by dividing the Ss into "regular," "irregular," "past" and non-users, because it was felt that there may be a personality difference between the high and low ends of the user spectrum. However, this breakdown produced very little statistical discrimination between these two user groups on any of the tests reported in this paper. Therefore, based on sample size and the self-report nature of this research, a decision was taken to combine the user subgroups in order to give greater simplicity and strength to the statistical analysis.

Following on, all component scores, together with the three total Absorption scores, were used as dependent variables in the calculation of univariate ANOVAs across the independent variables of Gender. The results of these analyses for significant effects are given in Table 5. From these calculations it appears that both TAS and TAC show only borderline significantly higher mean scores for women whereas in the case of TAO and C2AO the differences are stronger. For

Table 5. Univariate ANOVAs, Means and Standard Deviations for Absorption Variables across Gender

Absorption Variables	*F*-Ratio *DF* = 1,270	Prob.	Female (*N* = 203) Mean	Female (*N* = 203) *S.D.*	Male (*N* = 69) Mean	Male (*N* = 69) *S.D.*
Total Absorption Score	3.75	0.054	22.6	6.5	20.8	7.0
Total Absorption Opportunity	6.71	0.010	122.9	53.4	103.6	53.0
Total Absorption Capacity	4.06	0.045	145.3	60.5	128.3	60.6
Component 2 (Absorption Opportunity)	6.66	0.010	0.090	0.985	−0.266	1.003

this sample it would seem that the primary difference across gender is the greater emphasis by women for making more opportunities for absorptive states and particularly those of an intuitive/imaginative type (C2AO).

Next, univariate ANOVAs were calculated across the cannabis use factor for all of the Absorption total scores and component scores. The results indicate a strong statistically significant difference across all three total Absorption scores (see Table 6). From the post hoc tests performed it is evident the meaningful differences in mean scores for all three are to be found between the Current-User group and either of the other two with current users always showing higher overall TAS, TAO and TAC scores.[4]

Scores for both components of the Opportunity PCA show statistical significance across the levels of cannabis use with post hoc tests revealing that, as in the case of the total scores above, the real difference in means occurs between Current-Users and either of the two other groups. C2AO, "Intuitive/Imaginative Knowing," yields a considerably smaller probability of a Type I error than C1AO and can thus be taken as the more important dimension when identifying differences between the user groups. From this analysis it seems that opportunities made (frequency) for absorptive activities emphasize more the achievement of

[4] All post hoc probabilities reported are alphas for Fisher's Least Significant Difference statistic [38].

Table 6. Univariate ANOVAs, Means and Standard Deviations for Absorption Variables across Frequency of Cannabis Use

Absorption Variables	*F*-Ratio *DF* = 2,269	Prob.	Never Used (*N* = 68)		Past User (*N* = 91)		Current User (*N* = 113)		Post Hoc Tests (Fisher's LSD)
			Mean	*S.D.*	Mean	*S.D.*	Mean	*S.D.*	
Total Absorption Score	7.56	0.0006	20.8	6.9	20.9	6.8	24.0	5.9	CU > NU (0.0015) CU > PU (0.0010)
Total Absorption Opportunity	9.09	0.0002	105.0	49.8	107.9	52.6	134.0	53.6	CU > NU (0.0004) CU > PU (0.0005)
Total Absorption Capacity	8.49	0.0003	128.1	59.6	128.9	61.9	158.6	56.9	CU > NU (0.0009) CU > PU (0.0004)
Component 1 (Absorption Opportunity)	3.87	0.0221	–0.160	0.904	–0.125	1.004	0.197	1.026	CU > NU (0.0193) CU > PU (0.0213)
Component 2 (Absorption Opportunity)	5.58	0.0042	–0.200	0.924	–0.142	0.979	0.235	1.021	CU > NU (0.0043) CU > PU (0.0069)
Component 1 (Absorption Capacity)	3.57	0.0296	–0.200	0.849	–0.077	1.051	0.182	1.019	CU > NU (0.0125)
Component 3 (Absorption Capacity)	4.38	0.0134	–0.026	1.021	–0.219	1.074	0.192	0.890	CU > PU (0.0035)

intuitive and imaginative experiences although immersion, intero- and exteroceptively, is also important when comparing current to past and non-users.

In the analysis of the Capacity components, only C1AC ("Exteroceptive imaginal entrancement") and C3AC ("Interoceptive imaginal entrancement") show statistical significance. Here we have a reversal in emphasis from the case of Absorption Opportunity. In the case of C1AC the primary difference is to be found between Current-Users and Non-Users whereas with C3AC it is between Current-Users and Past-Users. These results seem to indicate that differences between current cannabis users and the other groups on the Capacity dimension are best distinguished through immersion and entrancement activities.

Following the univariate studies of Absorption across the individual factors of gender and cannabis, a two-way ANOVA was calculated for all Absorption variables across both these independent variables looking for interaction effects. However, only C1AC gives a statistically significant interaction ($F(2,266) = 3.2740$, $p = 0.0394$). The interaction plot of cell means (see Figure 1) clearly shows that women, who either never used cannabis or are past users, have higher "exteroceptive imaginal entrancement" capacity than men (of those user categories) with the female past users showing a statistically significantly higher mean C1AC score than male past users ($p = 0.005$) or male non-users ($p = 0.02$). Male and female current users are very similar in mean C1AC as well as are female non-, past and current users. However, male current users show significantly higher exteroceptive absorption capacity than either never using or past using men ($p = 0.007$ and $p = 0.002$, respectively). This analysis would tend to confirm that, in general, women have significantly more capacity for exteroceptive absorption except in the case of current users of cannabis where men show a slightly higher mean score.

Self-Perceived Motivation Loss, Cannabis Use and Absorption

As indicated previously all participants were asked to rate items regarding self-perceived levels of motivation loss ("Do you find that you lack motivation for the normal chores and activities required of your daily life?"). When a cross-tabulation is calculated for motivation loss and rate of cannabis use, a statistically significant dependency relationship is observed (Chi-square = 12.21, 4 *df*, $p = 0.0158$). However, two cells of the resultant table have fewer than five items, thus the relationship cannot be considered entirely reliable even though the chance of a Type I error is less than 2 percent (see Table 7). Nevertheless, it is evident from observing this table that Current Users are almost 50 percent more likely to place themselves in the highest motivation loss rank than either Never or Past Users. In addition, Current Users are about three times more likely to categorize themselves at the highest level of motivation loss than at the other two motivation ranks combined.

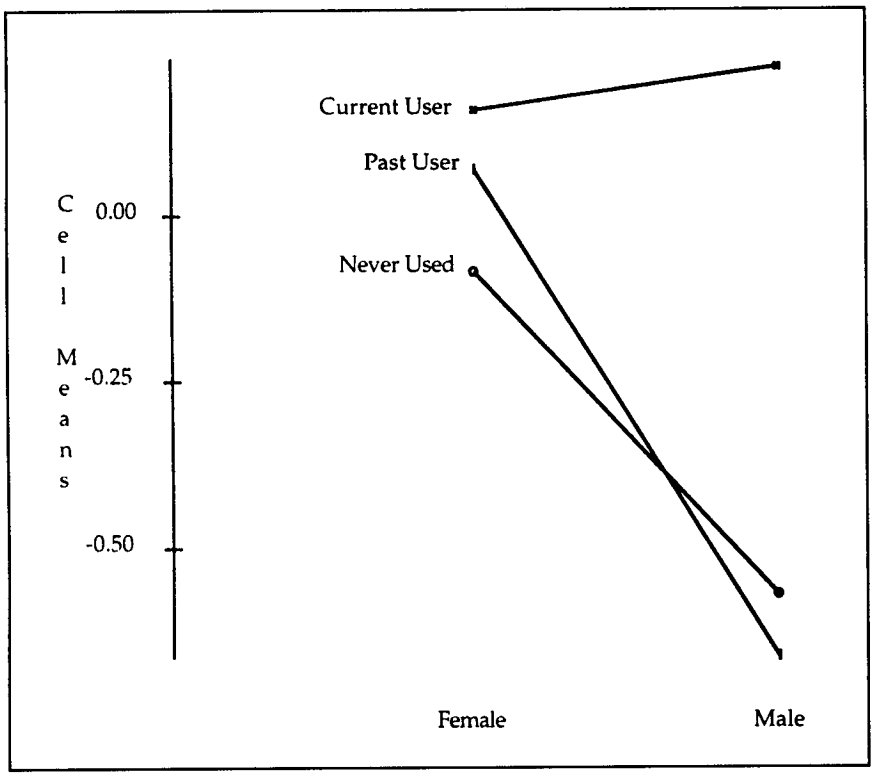

Figure 1. Interaction plot of means for C1AC (exteroceptive imaginal entrancement) across gender.

Those Ss who see themselves as never showing a loss of motivation are four to five times more likely to be Never or Past Users of cannabis than Current Users while those who believe that they rarely lose motivation are fairly equally distributed across the three levels of cannabis use. On the other hand, those Ss who rank themselves as more regularly experiencing motivation loss are more than twice as likely to be current cannabis users as opposed to non-users and about 1.7 times more likely to be Current Users than Past Users. Clearly, in spite of the weakness of some of the cells, there appears to be a direct dependency between cannabis use and self-perceived motivation loss with increasing use associated with decreasing motivation in this sample.

Univariate ANOVAs for all Absorption variables were calculated across the factor of Self-Perceived Loss of Motivation and the significant results are given in Table 8. For all three total Absorption scores (TAS, TAO and TAC) significant differences were found with those who report more motivation loss showing the

Table 7. Cross-Tabulation for Frequency of Cannabis Use and Levels of Self-Perceived Motivation Loss

	Rank of Self-Perceived Motivation Loss			
Frequency of Cannabis Use	Never	Rarely	More Often	Totals
Never Used				
Count	4	26	38	68
Percent of row total	5.88	38.2	55.9	100
Percent of column total	40	29.5	21.8	25
Percent of table total	1.47	9.56	14.0	25
Past User				
Count	5	35	51	91
Percent of row total	5.49	38.5	56.0	100
Percent of column total	50	39.8	29.3	33.5
Percent of table total	1.84	12.9	18.8	33.5
Current User				
Count	1	27	85	113
Percent of row total	0.885	23.9	75.2	100
Percent of column total	10	30.7	48.9	41.5
Percent of table total	0.368	9.93	31.2	41.5
Totals				
Count	10	88	174	272
Percent of row total	3.68	32.4	64.0	100
Percent of column total	100	100	100	100
Percent of table total	3.68	32.4	64.0	100

Note: Chi-square = 12.21 (4 *df*), $p = 0.0158$.

higher levels of Absorption. Post hoc tests reveal the differences primarily are due to the greater Absorption means for those who lose motivation more often as opposed to Rarely. Of the three total scores TAO shows the highest *F*-ratio suggesting that those who make more opportunity for absorptive states are most differential from the others.

Analysis of the component scores yields significance only for C2AO an C3AC. The pattern of difference is similar to that for the total scores and appears to indicate that the greater Opportunity made is in the realm of the imaginal and the higher level of Capacity is for interoceptive experience. However, all these results for motivation loss must be considered somewhat weak when taken in the light of the great disparity in cell sizes (10, 88, 174) and thus would require a larger sample to confirm.

Table 8. Univariate ANOVAs, Means and Standard Deviations for Absorption Variables across Levels of Self Perceived Loss of Motivation

Absorption Variables	*F*-Ratio *DF* = 2,269	Prob.	Never (*N* = 10)		Rarely (*N* = 88)		More Often (*N* = 174)		Post Hoc Tests (Fisher's LSD)
			Mean	*S.D.*	Mean	*S.D.*	Mean	*S.D.*	
Total Absorption Score	3.79	0.0238	20.70	7.66	20.69	7.11	22.98	6.21	R < M (0.0083)
Total Absorption Opportunity	6.08	0.0026	103.20	49.11	103.09	52.63	126.39	53.19	R < M (0.0009)
Total Absorption Capacity	3.71	0.0258	120.70	53.68	128.72	62.80	148.41	59.34	R < M (0.0131)
Component 2 (Absorption Opportunity)	7.04	0.0010	–0.225	1.058	–0.304	0.949	0.167	0.989	R < M (0.0003)
Component 3 (Absorption Capacity)	3.54	0.0303	–0.165	0.822	–0.218	1.048	0.120	0.969	R < M (0.0096)

An additional attempt was made to detect whether or not the loss of motivation and cannabis use factors interact in terms of determining the levels of observed Absorption scores. To this end two-way univariate ANOVAs were calculated for all the Absorption variables and PCA component scores as dependent variables across the independent variables of Cannabis Use and Self-Perceived Motivation Loss, but no statistically significant interaction effects were found.

Self-Perceived Depression, Cannabis Use and Absorption

The next analysis concerns the relationships between cannabis usage, self-perceived depression and Absorption. Table 9 provides a cross-tabulation between levels of Cannabis Use and rank of Self-Perceived Depression. The failure of the Chi-square statistic to attain a significant alpha indicates that these two ordinals

Table 9. Cross-Tabulation for Frequency of Cannabis Use and Levels of Self-Perceived Depression

	Rank of Self-Perceived Depression			
Frequency of Cannabis Use	Never	Rarely	More Often	Totals
Never Used				
Count	15	26	27	68
Percent of row total	22.1	38.2	39.7	100
Percent of column total	31.9	25.7	21.8	25
Percent of table total	5.51	9.56	9.93	25
Past User				
Count	16	38	37	91
Percent of row total	17.6	41.8	40.7	100
Percent of column total	34.0	37.6	29.8	33.5
Percent of table total	5.88	14.0	13.6	33.5
Current User				
Count	16	37	60	113
Percent of row total	14.2	32.7	53.1	100
Percent of column total	34.0	36.6	48.4	41.5
Percent of table total	5.88	13.6	22.1	41.5
Totals				
Count	47	101	124	272
Percent of row total	17.3	37.1	45.6	100
Percent of column total	100	100	100	100
Percent of table total	17.3	37.1	45.6	100

are relatively independent. There is a slightly increased tendency, however, for Current Users of cannabis to report being depressed More Often than for the self-reports of either Past Users or those who have never used.

As in previous analyses, all Absorption scores were used as dependent variables in univariate ANOVAs across the factor of Depression (see Table 10). For the group of total Absorption scores the significances for differences in cell means are quite strong with post hoc tests revealing a consistent pattern of the highest Depression rank showing a significantly greater mean Absorption score when compared to those who are either Never or Rarely depressed. The results of statistical tests of the derived PCA components are also significant for C2AO, C2AC and C3AC with a similar pattern in the post hoc comparisons as found in the total scores. Here again, the significant difference in the creation of absorptive Opportunity is primarily located in the dimension of the intuitive/imaginal and, in the case of Capacity, in both the intuitive and interoceptive activity domains.

Using a two-way design an attempt was then made to ascertain whether there were any interaction effects between the independent variables, Cannabis Use and Self-Perceived Depression, in determining Absorption cell means. Significant effects were found for three of the eight possible variables: TAO ($F(4,263) = 2.71$, $p = 0.0308$); C1AO ($F(4,263) = 2.42$, $p = 0.0493$); and C3AC ($F(4,263) = 2.68$, $p = 0.0320$). As can be seen in Figure 2, those who report never suffering from depression and never using cannabis have, on average, significantly lower mean TAO scores than either Past Users ($p = 0.005$) or Current Users ($p = 0.002$) who never report depression.

For those who have never used cannabis there is a steady and significant climb in average TAO score across the depression ranks ($p = 0.02$, $p = 0.02$) finally exceeding the average score for Past Users at the highest level of depression ($p > 0.05$). Current cannabis users show only a very small and insignificant rise in mean TAO score across depression ranks whereas Past Users show a non-significant drop from the Never rank followed by a rise across the next rank. Overall, those who have never used cannabis stand out in this analysis in that increasing levels of self-perceived depression show increasing mean total opportunity made for absorptive activities in contrast to current and past users who show consistently higher mean levels of TAO across Depression ranks. Current Users are over-all highest in TAO mean scores and vary very little no matter what the rank of Self-Perceived Depression observed ($p > 0.05$). Therefore, it would appear that overall higher means of TAO are connected to current cannabis use rather than depression, except for non-users, who show increasing TAO which is linearly related to frequency of self-reported depression. Past Users fall somewhere between the other two user groups and at the Rarely and More Often ranks of depression they are significantly different than Current users ($p = 0.03$ and $p = 0.005$, respectively).

In Figure 3 the interaction plot for C1AO ("Immersed entrancement") reveals a similar pattern of linear rise across the depression ranks for those who have never

Table 10. Univariate ANOVAs, Means and Standard Deviations for Absorption Variables across Levels of Self Perceived Depression

Absorption Variables	*F*-Ratio *DF* = 2,269	Prob.	Never (*N* = 47) Mean	Never (*N* = 47) *S.D.*	Rarely (*N* = 101) Mean	Rarely (*N* = 101) *S.D.*	More Often (*N* = 124) Mean	More Often (*N* = 124) *S.D.*	Post Hoc Tests (Fisher's LSD)
Total Absorption Score	10.39	≤0.0001	19.2	6.2	21.4	6.9	23.9	6.1	N < R (0.0463) N < M (0.00002) R < M (0.0042)
Total Absorption Opportunity	6.96	0.0011	100.3	52.3	111.0	51.7	130.4	53.7	N < M (0.0010) R < M (0.0065)
Total Absorption Capacity	8.99	0.0002	119.0	52.9	131.7	61.3	156.9	59.6	N < M (0.0002) R < M (0.0017)
Component 2 (Absorption Opportunity)	6.55	0.0017	–0.401	0.871	–0.054	1.035	0.196	0.973	N < R (0.0458) N < M (0.0005)
Component 2 (Absorption Capacity)	3.63	0.0277	–0.345	0.959	0.026	1.001	0.109	0.994	N < R (0.0348) N < M (0.0079)
Component 3 (Absorption Capacity)	6.40	0.0020	–0.287	0.922	–0.144	0.956	0.226	1.021	N < M (0.0025) R < M (0.0053)

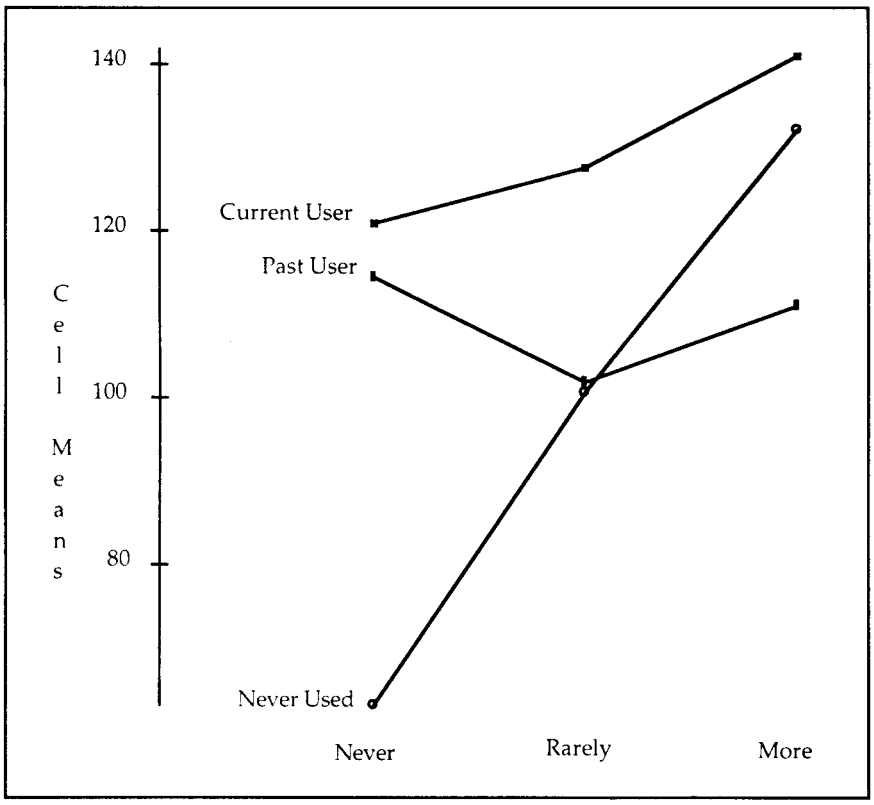

Figure 2. Interaction plot of means for Total Absorption Opportunity across levels of cannabis use and self-perceived depression.

used cannabis ($p > 0.05$, $p = 0.047$). For Current Users C1AO first makes a non-significant fall between the Never and Rarely depression ranks with a final rise to a value slightly above the initial C1AO level at the rank More Often. Past Users show a more linear, but non-significant, decline in mean C1AO across depression ranks with C1AO at the highest depression rank being less than for either non-users or Current Users ($p > 0.05$, $p = 0.010$, respectively).

Finally, Figure 4 is the interaction plot for the third significant variable, C3AC (Interoceptive imaginal entrancement). As in the other cases above, the mean values of C3AC for the sub-group of cannabis non-users rise steeply in a somewhat linear fashion across the ranks of Self-Perceived Depression (Never-Rarely, $p > 0.05$; Rarely-More Often, $p = 0.001$). The mean of C3AC for Current Users starts at a higher value than the other user groups at depression rank Never ($p > 0.05$ for comparisons to both other groups) and rises sharply, but levels out

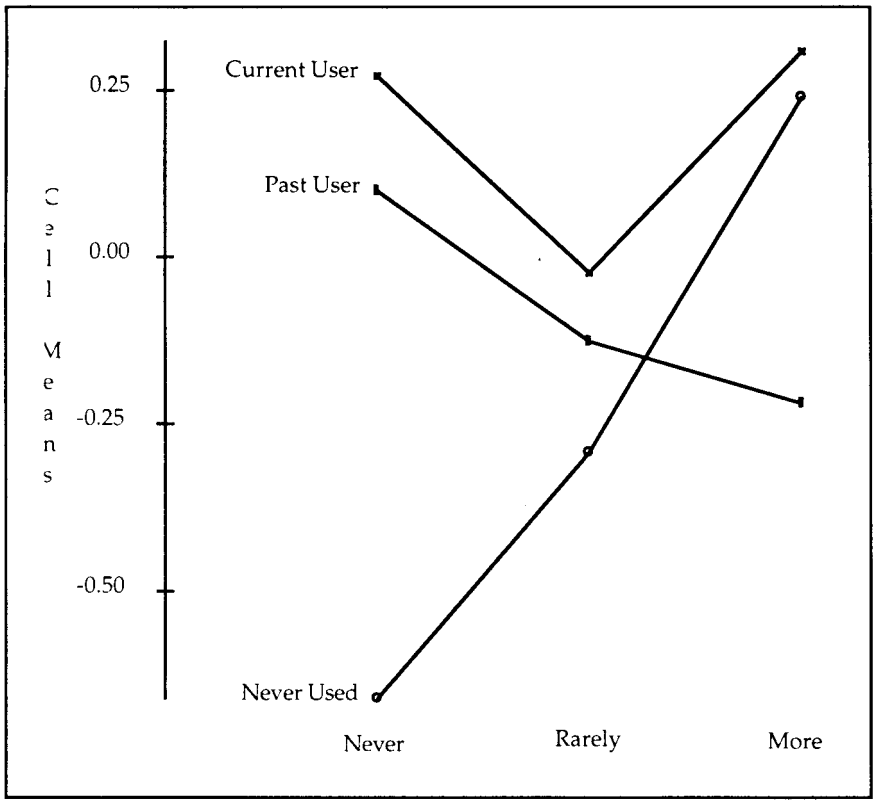

Figure 3. Interaction plot of means for C1AO (immersed entrancement) across levels of cannabis use and self-perceived depression.

over the next rank. Comparisons of Current User means at Rarely with Never Used means at the same depression level also show significance ($p = 0.033$) and a comparison of means for Current User-Rarely and Past User-Rarely also reveals a strong difference ($p = 0.0004$).

The change in direction of the plot for Current Users is opposite to that of the above variables and, unlike the others, the mean value of C3AC at the highest depression rank is lower than that for non-users ($p > 0.05$). However, the differences in the means across depression ranks for Current Users are non-significant and represent, as in the other two variables, the group showing the highest overall absorptive activity. In contrast to the previous analyses, the Past User group appears more variable with no significant difference between the first two depression ranks but a significant rise from the second to the third rank ($p = 0.007$).

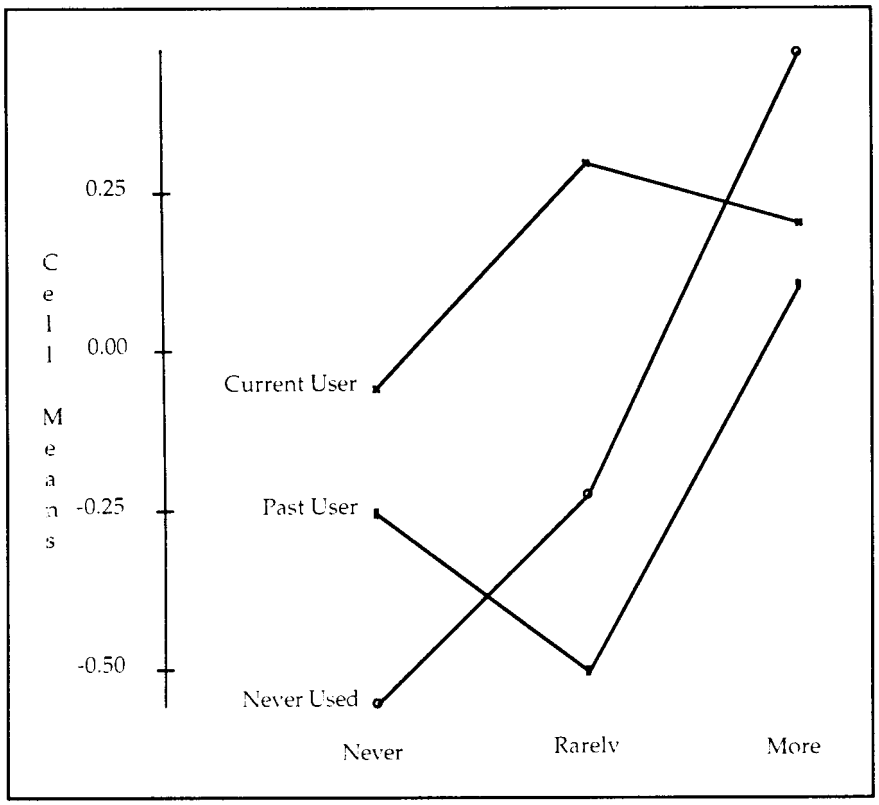

Figure 4. Interaction plot of means for C3AC (interoceptive imaginal entrancement) across levels of cannabis use and self-perceived depression.

Overall, it would appear that current cannabis users show the highest overall mean Absorption levels no matter how frequently they are subject to bouts of depression. On the other hand, for non-users of cannabis, mean levels of absorptive behaviors appear to increase in a linear manner with increasing reported depression. The Absorption variables which show this linear progression all appear to relate to 'immersion' behavior with the variable, C3AC, representing specifically interoceptively focused immersion. In general, it is in this case that non-users show higher absorptive activity than either of the other two user groups.

DISCUSSION

The operationalizing of Irwin's notions of "capacity" and "opportunity" as separately rated items for frequency of occurrence and ease of participation

corresponding to each TAS item has yielded two useful Opportunity dimensions in the former case and three useful Capacity dimensions in the latter [21]. This work thus confirms his initial conjecture regarding the importance of looking beyond the raw TAS score as the sole discriminative agent in studies employing Trait Absorption as a predictive variable. In this study the calculated component scores are capable of not only refining prediction by providing useful measures of frequency and true capacity, but they appear to yield finer discriminations through the use of the sub-attributes capable of making more specific determinations about the role of Absorption in behavior and cognition.

For example, in this sample when discriminating between the sexes, the TAS only provides a minimal significant separation which gives no clue as to how men and women differ in attentional behavior or style. The differences found on the TAO and C2AO subscales provide a stronger separation, however, indicating that women appear to make more opportunities for these sorts of experiences and that the type of experiences apparently sought are of an intuitive and imaginal nature. Further, when combining the gender analysis with the rate of cannabis use, this survey indicates that women have more capacity for exteroceptive absorptive engagement with the exception being current users of cannabis where men and women are statistically indistinguishable. To a degree, through the use of Absorption as a predictor, this analysis confirms a stereotype of women as being more interpersonally engaged, by the fact that they demonstrate more frequent intuitive behavior which tends to be focused outwardly.

Of course, in the case of cannabis use alone the TAS, TAO and TAC scores are all strong discriminators of cannabis users from lower scoring past and non-users. In this situation both components of the Opportunity PCA show the same pattern of significant difference as for the total scores but with the intuitive/imaginal dimension being a somewhat stronger discriminator. This difference may indicate that, although making opportunities for interoceptive and exteroceptive deployment of absorbed attention is a significant aspect of being a cannabis user, the seeking of intuitive ways of knowing may be an even more important motivator for cannabis users to make opportunities for absorption. On the other hand, when examining participants' capacity for Absorption, only C1AC and C3AC are useful discriminators of cannabis use, thus the difference in capacity for absorption appears to be mainly in the ability to deploy attention inwardly or outwardly in a highly immersed manner.

The positive connection between increased TAS, TAO and TAC to higher levels of self-perceived motivation loss may be understood as either being caused by the effect of cannabis on motivation or as a by-product of the preference for the more passive behavior which obviously would be a consequence of being in an absorptive state. When the results of examining the component scores are added to the analysis, there appears to be a related, albeit less strong, relationship between motivation and absorption similar to the cannabis use pattern with the exception that exteroceptive immersion does not reach a significant difference. Recalling

that there is a definite dependency relationship between cannabis use and motivation loss, it is difficult to disconfound the effect seen here from that for cannabis. It is thus difficult to interpret the meaning of these results without a more rigorous experimental design in which cannabis use and motivation loss can be disentangled. However, it is also noteworthy that post hoc tests reveal that the primary effect for motivation loss is to be found between More Often and Rarely levels which may be indicative of different underlying causes and/or personality types involved.

The strong, positive relationship of increasing absorption activity, as reflected in the three total scores, to increasing levels of self-perceived depression cannot, as in the case of motivation, be understood as merely a secondary result of a dependency between cannabis use and depression. Although there may be some overlapping variance between these two factors, as witnessed by similarities in Opportunity and Capacity found regarding absorption in cannabis use, component score means in this instance show significantly greater capacity for intuitive knowing for those reporting more instances of depression. Thus, it would seem that a primary observable difference amongst groups of differing levels of depression is their differing capacity to enter into intuitive and imaginal experiences.

The interaction between depression and cannabis use for Absorption highlights further the real differences in absorptive frequency and capacity across these two factors. Overall, current users of cannabis have more capacity and make more opportunities to engage the world in an absorptive way with the level of depression apparently being irrelevant. Past cannabis users show a slightly more varied but related pattern, but non-users of cannabis reveal a strong positive relationship between self-reported depression and the rate of making opportunities and having capacity for absorptive experience. The latter situation makes more sense when we consider that, in addition to this pattern existing for total opportunity, the intero-, exteroceptive opportunity and the interoceptive capacity components show a similar progression which can be interpreted as increasing depression leading to increasing time spent introspectively inward dwelling. Or, conversely, those who have a higher innate capacity for interoceptive immersion may make more opportunities for deploying attention inwardly which may become part of the mechanism in the etiology of increasing bouts of depression.

Although the data suggest that there is no dependency relationship between depression and cannabis use, increasing use of cannabis is strongly associated with decreasing motivation. Again, it is not possible to surmise from this exploratory model what, if any, is the causal connection. However, it can by hypothesized that increasing motivation loss due to increasing use of cannabis may lead to a decrease in external physical participation with an attendant increasing role as "observer." For those high in overall absorption this may be self-rewarding, thus leading to a life style where total deployment of attentional resources, externally or internally, becomes one of the primary activities of "participation" in the life process. Furthermore, part of the enjoyment of this role of "absorbed observer"

may come from the increasing frequency of imaginal and intuitive experiences which appear to accompany external and/or internal attentional immersion. In the case of past users of cannabis, however, the general levels of absorption are somewhat less and, as a result, the associated life-style and activities may not have provided enough reward to overcome the negative reinforcement of whatever was perceived to be lost through the use of cannabis.

On the other hand, greater capacity for interoceptive deployment of attention may be connected to increasing depression for cannabis users and non-users alike, if, as suggested, inward dwelling is part of the etiology of depression. Although no significant difference was found on this capacity component for cannabis users, the plot of Figure 4 reveals a jump in this capacity for users from those who never have depression to those who do. However, it would require carefully controlled experimental studies to disentangle the causal web underlying Absorption, cannabis and depression.

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