

# Introduction

Decades ago, the DSM-III was released, using specific behavioral and cognitive criteria clustered with each diagnosis to aid in the process of standardizing diagnoses and improving reliability between clinicians, so that research might be conducted more effectively across multiple sites and situations, as well as across various psychopathologies. Although DSM-III was a vast improvement over the preceding DSM, the overall effect in terms of standardizing diagnoses may have been less successful than hoped, as clinicians' diagnoses have remained somewhat unreliable across locations, theoretical perspectives, and the "popularity" of a diagnosis at a given time historically. While noting these difficulties, there was improvement, and mental illnesses became more comprehensive as distinct categorical constructs. However, in reality, many patients do not seem to "fit" precisely into a diagnostic category because they may fail to demonstrate all the required criteria, and furthermore, there is large overlap between many mental disorders, in that a specific criterion may be found in numerous mental disorders and families of disorders. For example "anxiety" is found in many diagnoses, to different degrees. These limitations have made the practice of diagnosing in accord with the specific illnesses in the DSM-IV-TR difficult and often not useful.

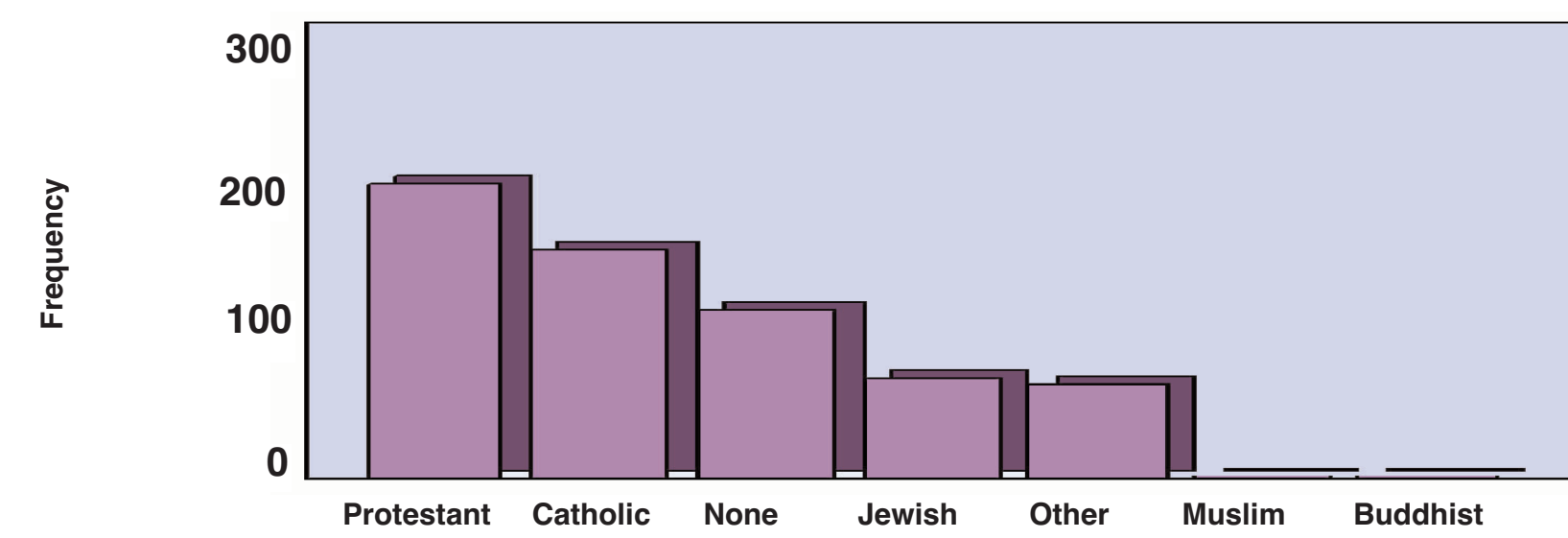
Some clinicians today, including psychiatrists, psychologists and others, have shifted to regarding the diagnosis of severe psychopathology, or long-

standing problems in living, as best determined by how patients' unique constellation of symptoms respond to medications, rather than the clusters of criteria they meet initially, or even over time, in the DSM-IV-TR. Because medications are known to enhance or control the effects of specific neurotransmitters, leading to positive changes in the particular symptoms or criteria such as those making up the mental illnesses in the DSM-IV-R, this translates to a different method of conceptualizing patients' problems, albeit crude at this point. The clinician working with this model might consider the symptoms the patient describes as typical of a "too low" or "too high" dopamine or serotonin syndrome, or both, with the general understanding that the neurotransmitters are functioning as a complex adaptive system, and while one might be targeted at the moment, it is only because it is what we have to go on right now, and a dopamine enhancer has been found most helpful for that particular symptom, even though it is understood that low serotonin is also involved in the symptom. Other neurotransmitters involved in a dopamine-specific symptom, may include serotonin, neuropeptide, acetylcholine and others. As neuroscience, genetics, and psychopharmacology continue to add to our knowledge of neurotransmitters and the complex manner in which they interact, working together in neural networks throughout the brain, and ultimately affecting behavior, mood, and cognitions, the link between neurotransmitters and behavioral attributes or criteria becomes more obvious. Clinicians and milder psychological dysfunction from the perspective of neurotransmitter deficits, rather than diagnoses alone, or even diagnostic categories in which the criteria are often overlapping. Personality, individual differences, and psychopathology may be characterized to some extent, by this model, unsophisticated though we might still be in our understanding of the system of neurotransmitters governing personality, mood and behavior.

The present study was designed to develop a measure, first piloted with a college sample then revised, based on this model of thinking about psychopathology, and psychological problems. The NAQ was developed with consideration of potential clinical applications, for research in psychopathology, and in personality, both normal and abnormal. We investigated the specific questions asked by a psychiatrist related to behavioral and cognitive criteria, on which people show marked individual differences, and when taken in clusters are associated with complaints of distress, psychological problems, or difficulties in life. These clusters or problems, some of which have specific diagnoses, are often well treated with either dopamine enhancers such as Wellbutrin, Ritalin and others, or with serotonin enhancers such as Prozac, Celexa, Lexapro and others, or sometimes with both. We did not include specific questions related to other neurotransmitters in our measure, as there are no specific behaviors

effectively and which to try first, to see how the patient responds. The questions selected were specifically those aimed at treating dopamine deficits, and/or serotonin deficits. The NAQ was first piloted in a study at a major university, after which some items were discarded, some revised for clarity, and some added. The **Serotonin-deficit** subscale consists of 27 items, derived from the serotonin-deficit questions, and the **Dopamine-deficit** subscale consists of 20 items from the dopamine-deficit questions. A third subscale, **Speedy**, consists of 4 items also derived from the dopamine deficit questions, however these items differ in that they indicate a love of high velocity, high danger, but somewhat controlled situations such as enjoying driving fast, or playing high energy sports. As predicted, this subscale does not correlate with any measures of psychopathology or psychological distress, although it correlates with extraversion. Reliability for the Dopamine-deficit subscale, using Cronbach's alpha, is .84, and the Reliability Alpha for the Serotonin-deficit subscale is .80.

Figure I. Frequency of Religions in the Sample



Other measures included: **The Interpersonal Guilt Questionnaire-67** (IGQ-67; O'Connor, Berry, Weiss, Bush & Sampson, 1997); **The Center for Epidemiologic Studies Depression Scale** (CESD; Radloff, 1977); **Generalized Anxious Temperament** (GAT; Akiskal, 1998); **The Jasper-Goldberg Adult ADD Screening Examination** (Jasper, & Goldberg, 1993, revised 2003); **The Obsessive Compulsive Inventory** (Foa, Kozak, Salkovovskis, Coles, & Amir 1998); and **The Brief Big Five Personality Inventory, V44** (BFI-44; John, Donahue, & Kentle, 1992).

## PROCEDURES

Participants who heard about the study and wanted to participate, did so whenever they chose to, and indicated informed consent by clicking an appropriate button at the beginning, before proceeding with the study. Data came into our server through Filemaker Pro, and was then transferred to SPSS for analysis.

# Results

Our results indicated that our subjects reported a variety of psychiatric diagnoses (see Table 1) and current use of psychiatric medications (see Table 2).

Table 3 and Figures II through Figure VII present the correlations between Dopamine and Serotonin-deficits and the standardized measures of psychopathology, the CESD, the FOC, the GAT, the Jasper-Goldberg ADD, Survivor Guilt and Omnipotent Responsible Guilt. Table 3 presents the correlations between the Big Five personality factors, with the Dopamine and Serotonin-deficit subscales of the NAQ, also by gender. Almost all of the correlations were significant, with few exceptions.

Table 1. Frequency of Self-Reported Diagnoses\*

Self-Reported Diagnosis	Frequency	Percent
Depression	109	17.6
Anxiety	34	5.5
Bipolar Disorder	18	2.9
ADHD	10	1.6
Insomnia	14	2.3
Addiction	4	.6
PTSD	1	.2
Anger	1	.2

\*Some participants reported more than one diagnosis; each diagnosis was counted in these cases

Table 2. Most Frequently Used Psychoactive Medications\*

Medication	Frequency	Percent
Selective Serotonin Re-uptake Inhibitor	115	18.5
Benzodiazepine (valium, klonopin, etc)	43	6.9
Wellbutrin	28	4.5
Mood Stabilizer	17	2.7
Antipsychotic	16	2.6
Tricyclic Antidepressants	14	2.3
Stimulant	8	1.3
Ambien/Sonata	6	1.0
Provigil	2	.2

\*Some participants reported more than one diagnosis; each diagnosis was counted in these cases

# Neurotransmitter Attributes Questionnaire: Personality on the Internet and in the Classroom

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## Abstract

In a study conducted online, 621 participants completed the Neurotransmitter Attributes Questionnaire (NAQ), a self-report instrument with subscales of Dopamine and Serotonin deficits. To validate our items related to low dopamine and low serotonin, we used other measures of psychopathology known to indicate treatment with either dopamine enhancers, serotonin enhancers, or both, such as the CESD for Depression, the Jasper-Goldberg ADD screening device, a version of the OCI (Foa), Generalized Anxious Temperament (Akiskal) and a measure of exaggerated guilt and worry about other people, the Interpersonal Guilt Questionnaire-67 (O'Connor, Berry, et al). In addition we included the Big Five Factor (John et al) to evaluate personality variables associated with dopamine and serotonin. Participants also reported current psychiatric disorders. Results demonstrated the reliability and validity of the subscales of the NAQ, and analysis of the self-reported diagnoses gave similarly significant results as the standardized instruments, in terms of significant associations with other expected variables. ADD in women had a higher correlation with serotonin as well as dopamine than men, although both men and women had significant deficits of both. This may add to our understanding of ADHD in girls and adult women. Conscientiousness was found significantly, negatively correlated with Dopamine-deficits, another validation of the NAQ. We also found depression predicted by dopamine-deficits in men, equal to serotonin-deficits.

In a second study, 38 college students completed the same measures, as well as questionnaires about their "at the moment" activities and emotions, using the Experience Sampling Method (ESM), with the data collected randomly, eight times per day for a semester. Significant correlations were found between low serotonin and feeling worried, strained, un-relaxed, not good about oneself, and mentally tired. NAQ subscales correlated with the other measures as in the first study, and differences between males and females were also equivalent to results found in the larger study. The need for gender-sensitivity, and case-specificity, in treating mental disorders and milder psychological distress is suggested and the effective use of a neurotransmitter-focused assessment before deciding on a specific psychopharmacological treatment is one conclusion suggested by these studies. The potential research applications in social cognitive neuroscience and psychopathology might, potentially, help to lead us further in understanding the mechanisms underlying many psychological problems.

Figure II. Self-Reported Diagnosis

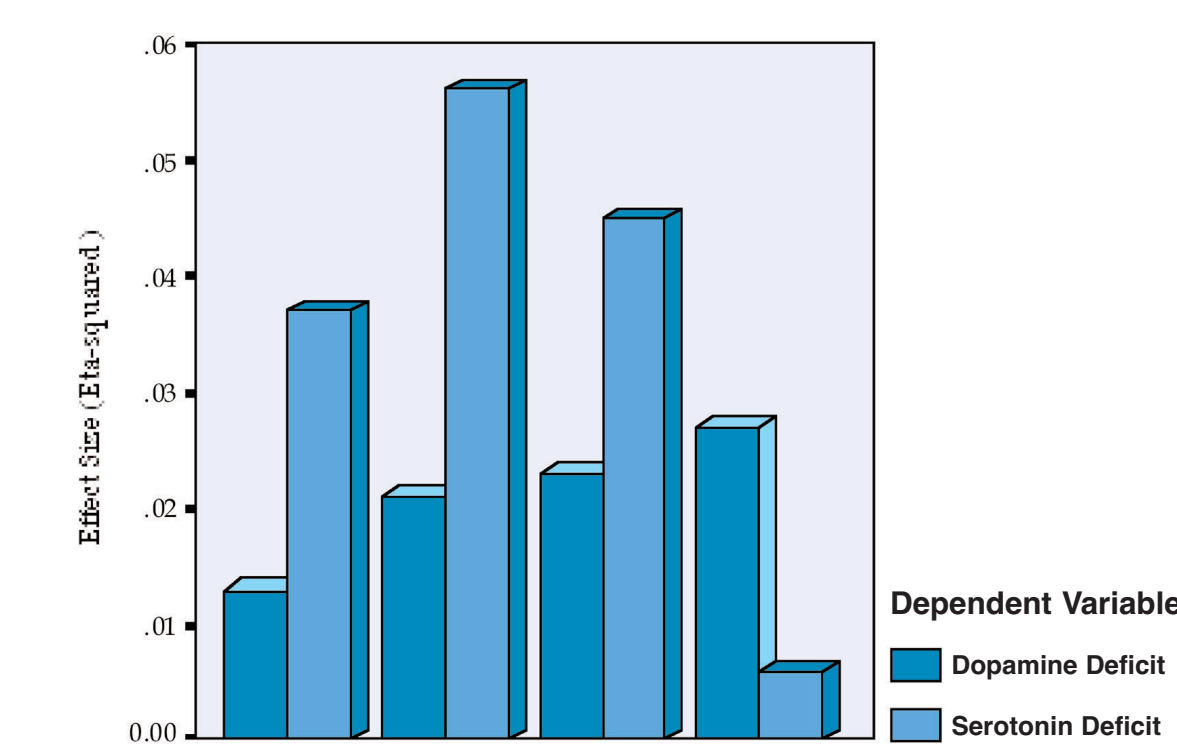


Figure IV. Gender and Prediction of ADHD

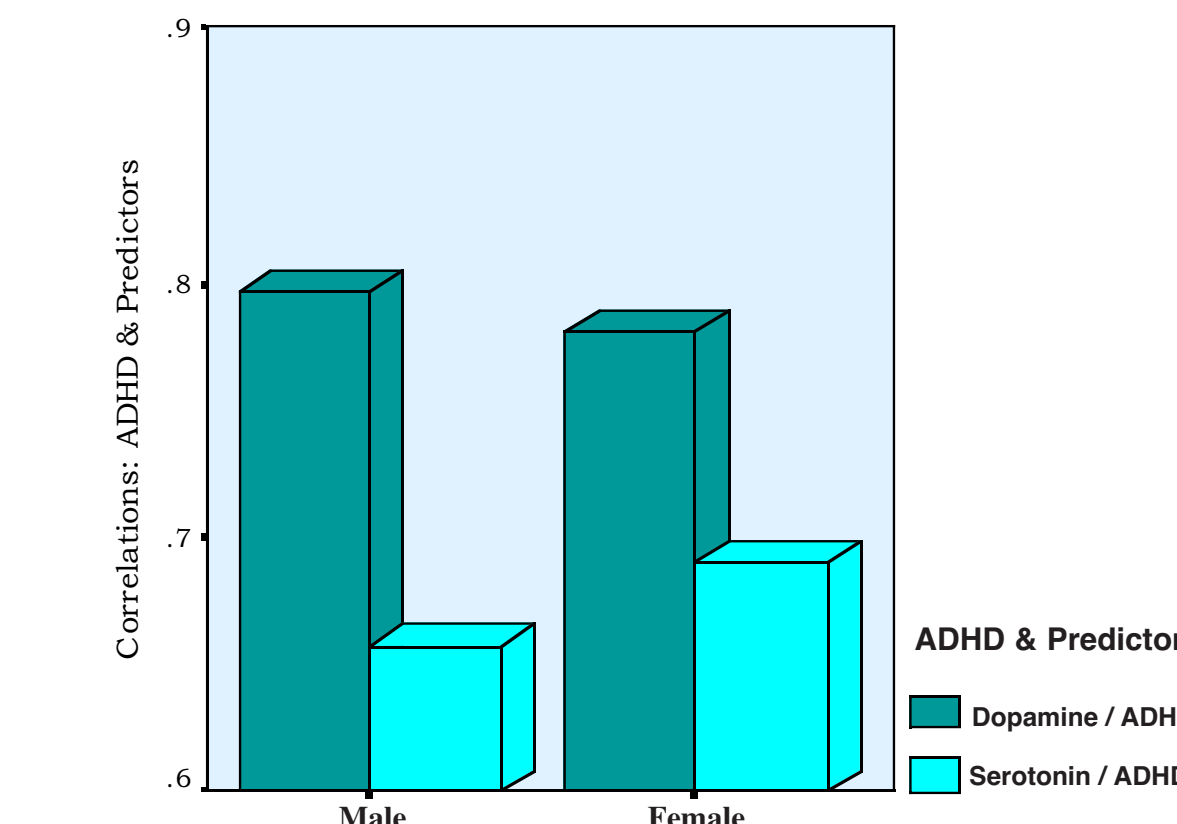


Figure VI. Conscientiousness and Dopamine and Serotonin Deficits

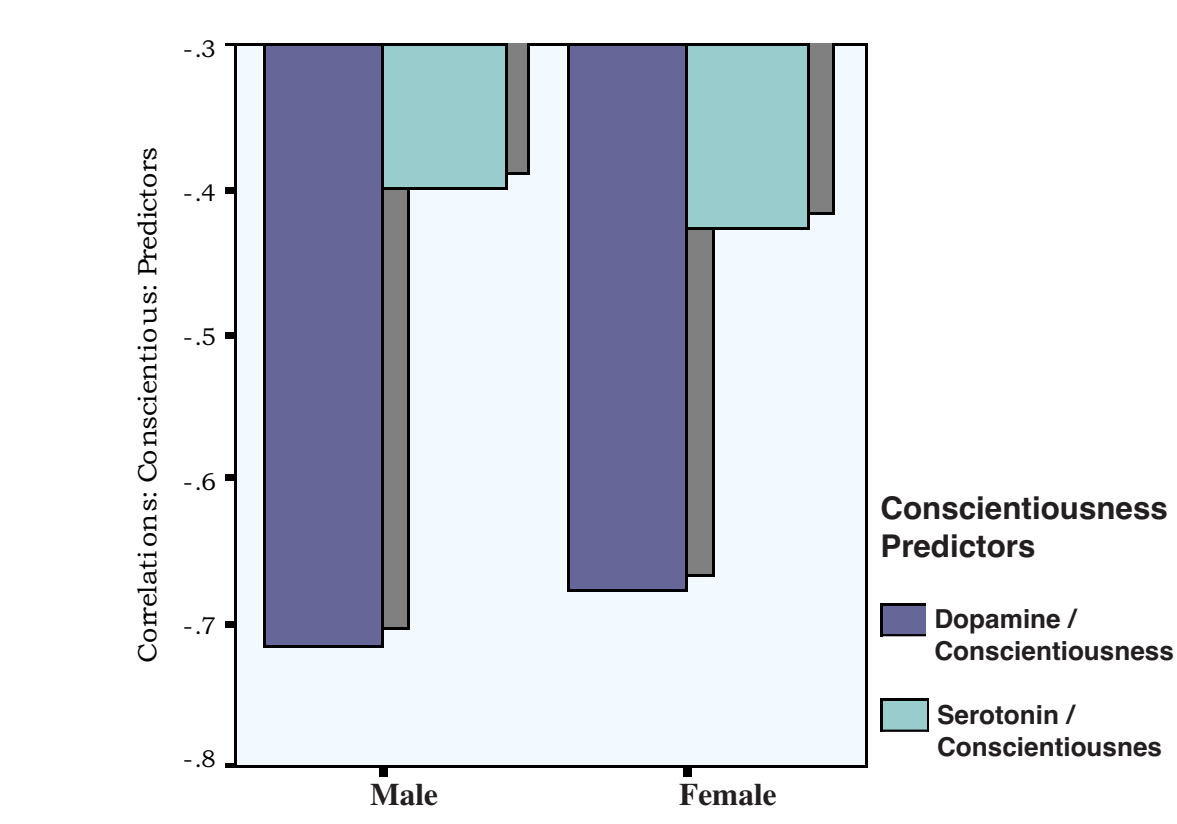


Table 4. Low Dopamine, Low Serotonin

	Low Dopamine	Low Serotonin		Low Dopamine	Low Serotonin
Enjoying what you are doing?	.193	-.214	Happy	-.104	-.340
Activity-Interesting?	.306	.023	Sad	.112	.170
Activity: How concentrating?	-.015	.066	Weak	.243	.224
Living up to own expectations?	-.206	-.315	Strong	.077	.104
Feel in control?	.040	-.297	Passive	.332	.318
Involved, able to act?	.170	.174	Active	.129	-.054
Ability to deal w/ situation?	.048	-.106	Excited	.110	-.156
Invited, important to you?	.049	.155	Bored	.092	-.040
Others expecting a lot?	.048	.111	Cheerful	-.083	-.149
Succeeding in what you're doing?	.009	.285	Lonely	.168	.054
Wish doing something else?	-.072	.166	Nervous	.203	.221
Feel good about self?	-.155	-.391*	Cooperative	.108	-.105
			Angry	.047	.202
			Responsible	.115	.115
			Frustrated	.100	.290
			Competitive	.179	-.097
			Strained	.211	.353
			Worried	.111	.399**
			Carrying	.023	.183
			Irritated	.180	.218
			Relaxed	-.134	-.385*
			Stressed	.062	.226
			Friendly	.181	-.094
			Mentally tired	.194	-.389*

Table 3. Correlations between standardized scores on Major Variables, by Gender

INDEPENDENT VARIABLES	Dopamine-deficit		Serotonin-deficit	
	Men	Women	Men	Women
DEPRESSION (CESD)	.580***	.488***	.635***	.601***
Anxiety (GAT)	.566***	.503***	.749***	.761***
Attention Deficit Disorder (ADHD)	.820***	.765***	.651***	.688***
OCID (OCI-revised)	.342	.232*	.595**	.390**
Survivor Guilt	.450***	.340***	.554***	.417***
Omnipotent-Responsible-Guilt	.460***	.281***	.460***	.431***
PERSONALITY (BBF-44)				
Extraversion	-.189**	-.056	-.324***	-.197***
Neuroticism	.514***	.463***	.749***	.730***
Conscientiousness	-.717***	-.658***	-.436***	-.428***
Agreeableness	-.324***	-.338***	-.319***	-.343***
Openness	-.106	.023	-.202**	-.051

\*\*\*Correlation is significant at the .001 level)  
\*\*Correlation is significant at the 0.01 level  
\*Correlation is significant at the 0.05 level

## Discussion

The results of this study demonstrate that it may be well worth while for non-psychiatric physicians who often prescribe more psychiatric medications today than do psychiatrists, to ask patients specific questions about their feelings, and their personality characteristics when they complain of depression, anxiety, and other symptoms, that may be regarded as idiosyncratic or even disagreeable personality variations rather than signs of dysfunctions. The results of this study support knowledge held by psychopharmacologists but not necessarily integrated into the knowledge base of general medical practice, although general practitioners are more often the physicians treating depression and anxiety daily. Though some or even many psychiatrists already know that depressed women are most likely to need an SSRI only, but depressed men often need a dopamine enhancer as well, many internists do not; these results demonstrate clearly a possible explanation. However there are subtleties found by the measure, while it supported the broad knowledge in the field, that suggest individual differences may be highly important in treatment, and that the questions commonly asked by specialists in psychopharmacology should be moved into the internist's office, so all patients are able to be evaluated with a case-specific approach.

In addition, the NAQ has potential use beyond clinical applications, that is as a research instrument to be used in the study of psychopathology and social cognitive neu-

rosience. Someone who has been classified on the NAQ may be part of basic research on human mental processes, normal and abnormal, and it is to this end that the NAQ may be potentially highly productive. In a second study, conducted in collaboration with Wilson, 38 students attending a college class at a major university completed the same instruments as in the study described above. In addition, for the semester during which students were in the class, they completed questionnaires consisting of items about their immediate circumstances and 33 variables related to their current emotions and psychological state, developed by Csikszentmihalyi, Schneider and Sloan, for a larger study of adolescents, using the Experience Sampling Method (ESM). Students were randomly beeped eight times per day and asked to fill out the questionnaire. The data derived from the ESM were analyzed along with the NAQ and other instruments, to determine the relationships between students' immediate experience and their scores on the Dopamine and Serotonin-deficit subscales of the NAQ, as well as the other measures of psychological problems. While the small N in the sample limited the significance of multiple items correlated with the NAQ, the correlation coefficients were sizeable enough to suggest that with a larger sample, the Dopamine and Serotonin-deficit subscales would be predictive of students' "at the moment" responses. Results are reported in Table 4.