

# 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 unhelpful.

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, norepinephrine, 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

researchers are examining severe 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 NAOQ 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, or 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 Methylphenidate, 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

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

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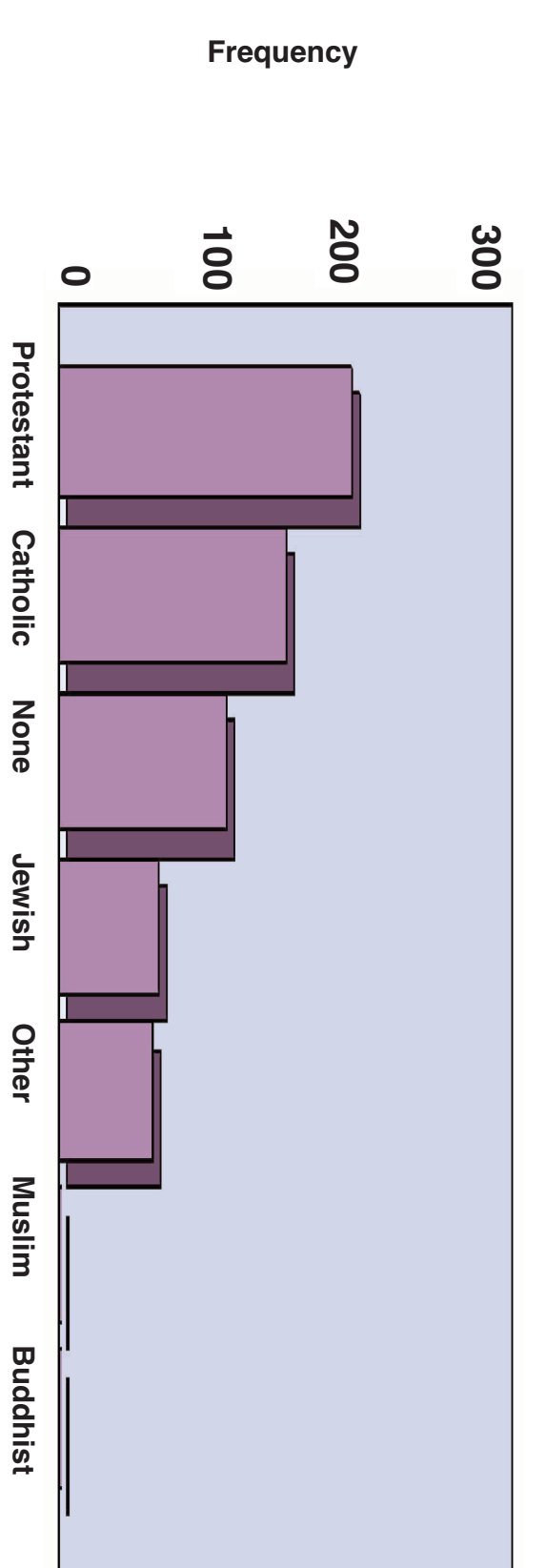
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## Abstract

In a study conducted online, 621 participants completed the Neurotransmitter Attributes Questionnaire 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 Anxiety Disorder (Ackska) 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 NAOQ, 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 NAOQ. 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 worry, strained, un-relaxed, not good about oneself, and mentally tired. NAOQ 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.

## Methods

Figure 1. Frequency of Religions in the Sample



This study included 621 participants (449 women, 169 men and 3 undisclosed gender) who were invited to participate through notices, word of mouth, or directly through the initial emails posted by the researchers on academic and other listservs, such as spsp-discuss, evolutionary psychology, and secp, as well as repeated advertisements in the "Volunteer" section of on-line Craig's List in a variety of large cities. Participants were invited to go to our research group, the Emotion, Personality and Altruism Research Group web site (www.eparg.org) and there, go to the study called "Emotions and Personality." All participation was anonymous; we have no knowledge of the IP address of any participant, nor do we know their email addresses.

Participants ages ranged from 18 to 84, with the mean at 35.30, they live or have lived all over the world although the majority (over 78%) are from the US, and they reported a range of ethnicities. While there was a wide range, almost 80% were European American and religions (see Figure 1). Of this sample, 529 (85%) were heterosexual, 25 (4%) were homosexual, 61 (9.8%) were bisexual, and 6 (1%) were undisclosed as to sexual orientation.

## INSTRUMENTS

A variety of instruments were used to determine the validity of the two main subscales of the Neurotransmitter Attributes Questionnaire (NAOQ; O'Connor, Lewis, & Berry, 2005), the Dopamine-deficit Subscale and the Serotonin-deficit Subscale, and to determine whether or not this instrument might be useful for internists and other primary care physicians, in making a decision as to what type of medication might be best when a patient complains, for example, of depression. We also included standard measures of psychopathology, known to be associated with either low-dopamine, that is treated with a dopamine enhancing medication, or low-serotonin, that is treated with a serotonin enhancing medication. Finally, we included a basic personality instrument with the big five factor subscales, as a beginning exploration of the big five from the perspective of the model of neurotransmitters. We also had a demographic part of the on-line study, in which we asked the participants to respond to questions about their use of medications and their current psychiatric problems and diagnoses, if they had any.

**Neurotransmitter Attributes Questionnaire (NAOQ; O'Connor, Lewis, & Berry, 2005)**, is a 51-item questionnaire, with responses indicated on a likert scale of 1 to 5. The instrument was derived from a list of questions gathered from a psychiatrist, who specializes in psychopharmacology, typically asks patients before determining what medication(s) might help the patient most

## PROCEDURES

Participants who heard about the study and wanted to participate, did so when-ever 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

Table 1. Frequency of Self-Reported Diagnoses\*

Self-Reported Diagnoses	Frequency	Percent
Depression	109	17.6
Anxiety	34	5.5
Bipolar Disorder	18	2.9
ADHD	10	1.6
Wellburn	17	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 (Serotonin, etc)	115	18.5
Benzodiazepine (Valium, Klonopin, etc)	43	6.9
Wellburn	28	4.5
Mood Stabilizer	17	2.7
Antipsychotic	16	2.6
Tricyclic Antidepressants	14	2.3
Stimulant	8	1.3
Amphetamine/Sonata	6	1.0
Prozac	2	.2

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

Figure II. Self-Reported Diagnoses

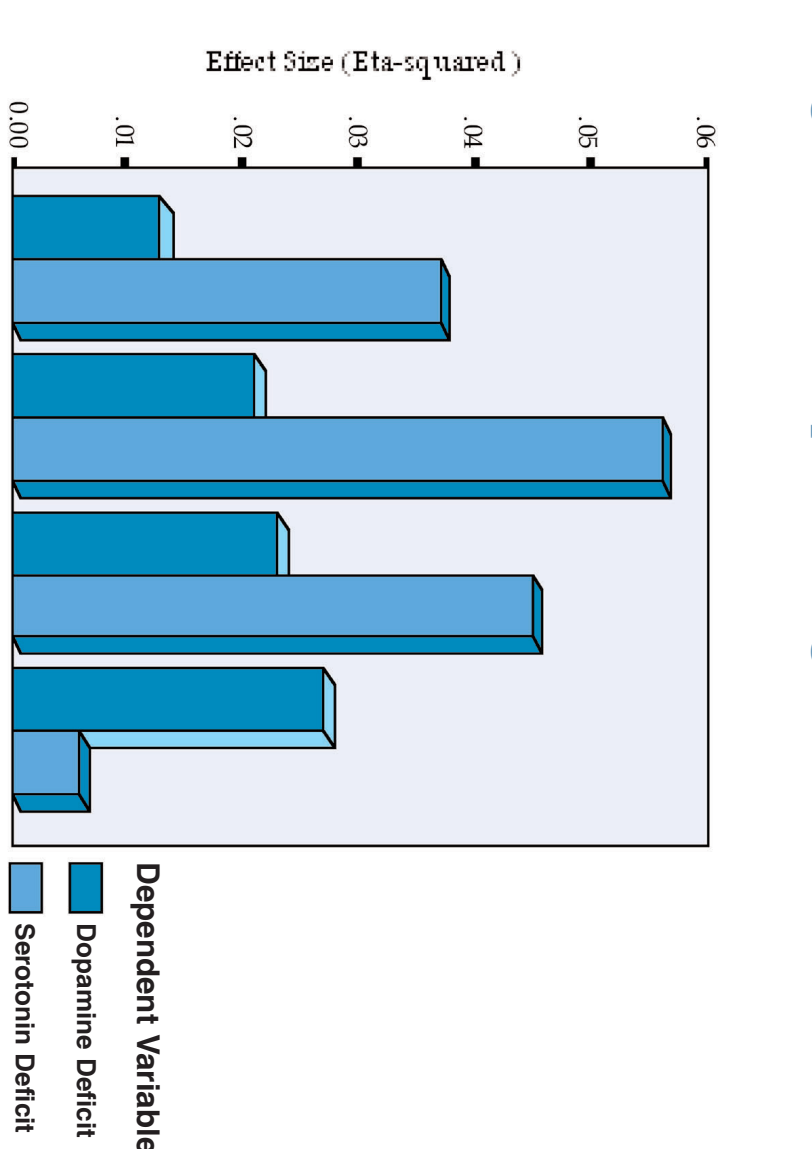


Figure III. Gender and Prediction of Depression

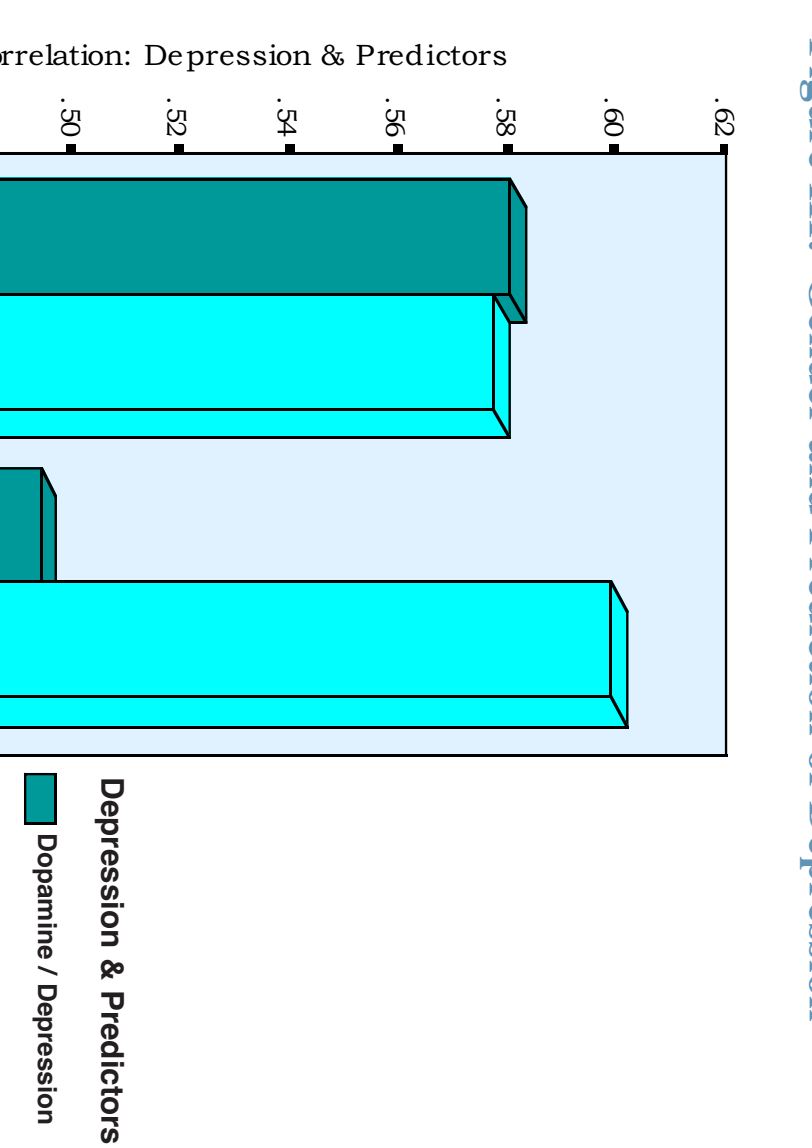


Figure IV. Gender and Prediction of ADHD

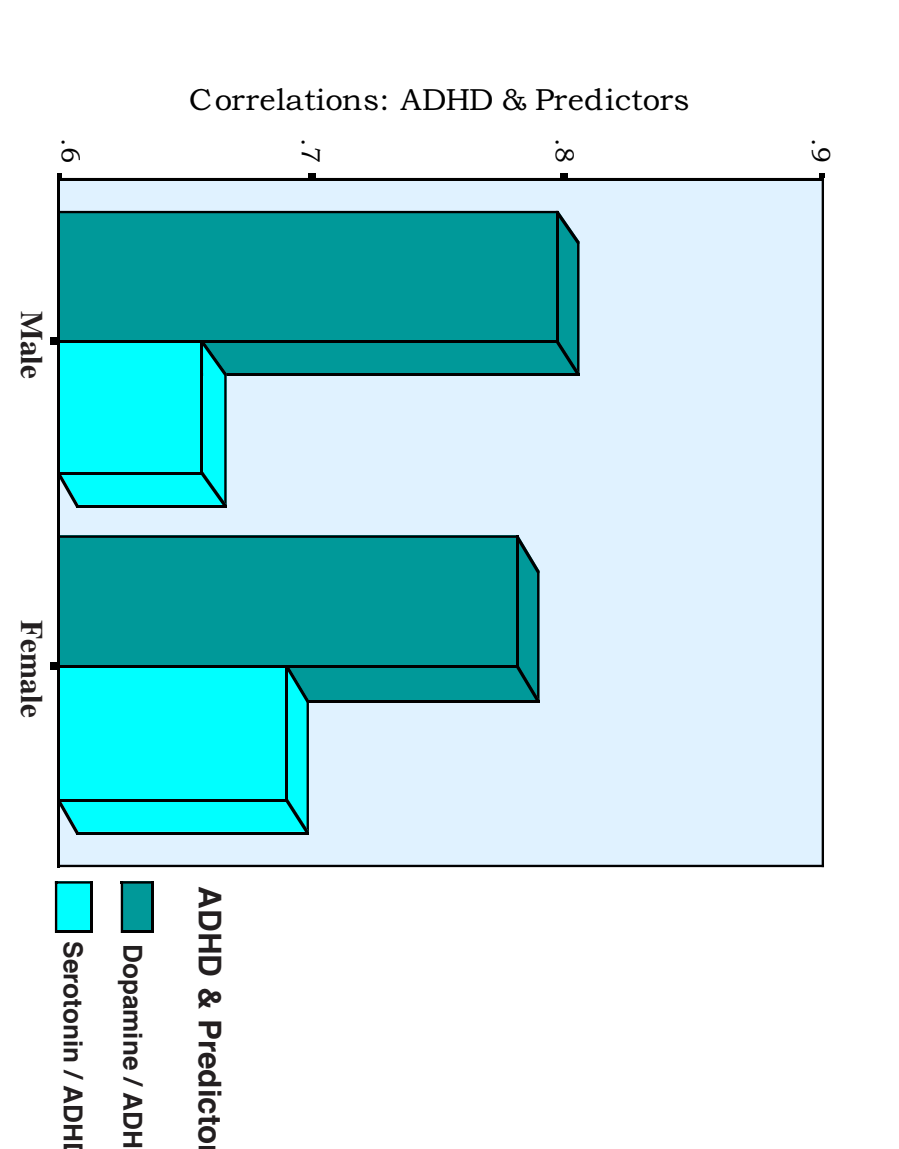


Figure V. Gender and Prediction of OCD

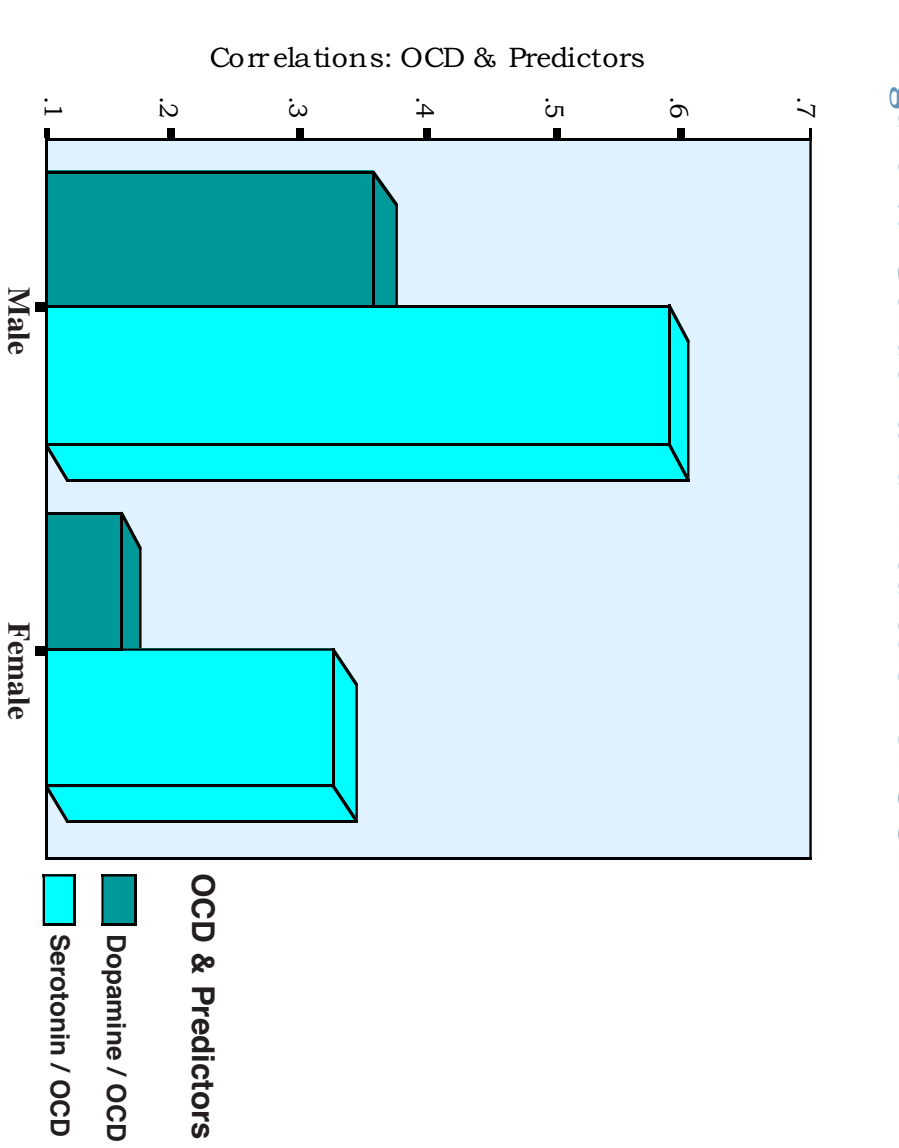


Figure VI. Conscientiousness and Dopamine and Serotonin Deficits

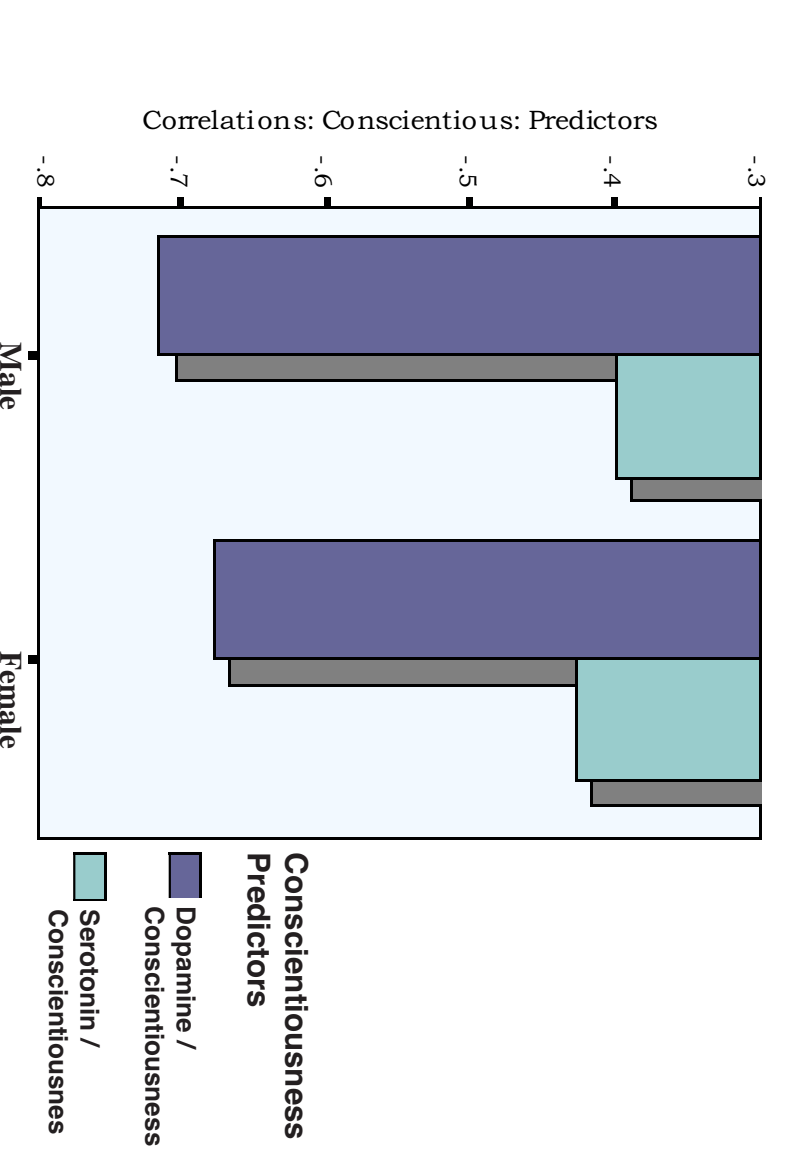


Figure VII. Partial Correlations between Predictions of Psychopathology by Measures and Personality

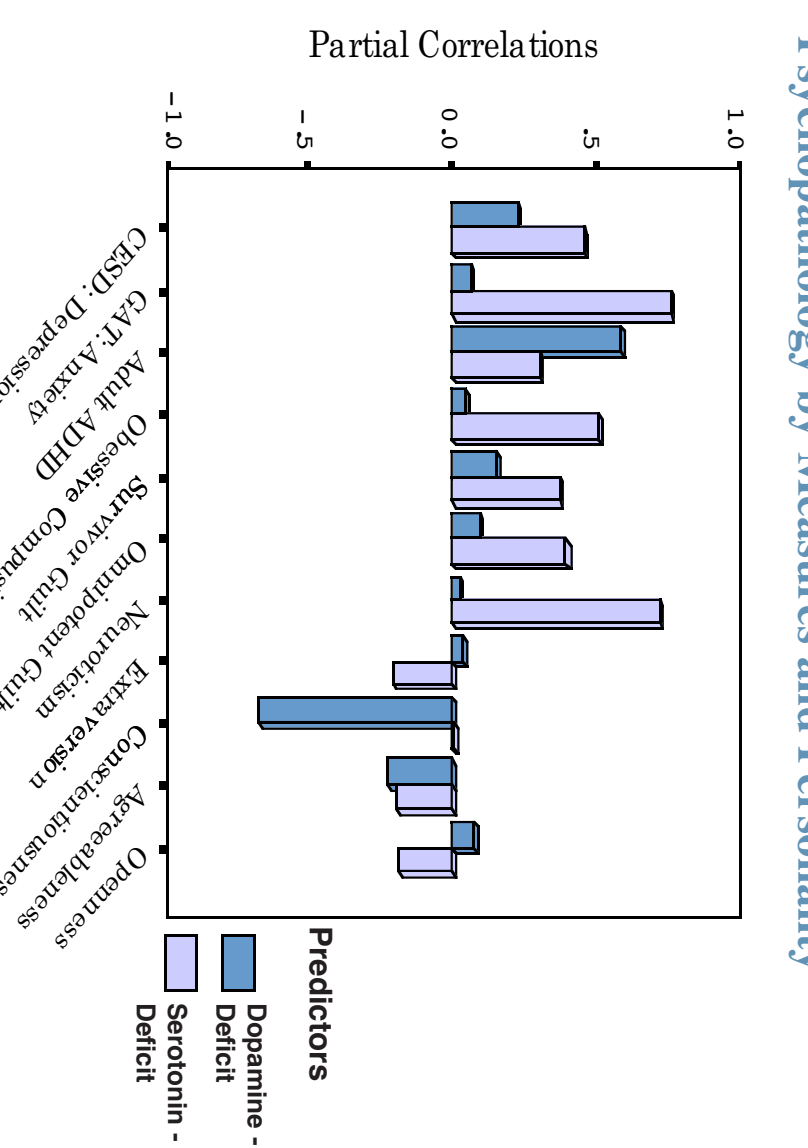


Table 4. Low Dopamine, Low Serotonin

	Low Dopamine	Low Serotonin
Enjoying what you are doing?	.183	-.214
Active; How conscientious?	-.015	-.066
Lying up to own expectations?	-.206	-.315
Feel in control?	.040	-.287
Actively to deal w/ situations?	.048	-.186
Others expecting a lot of things of you?	.048	-.186
When doing something else?	-.072	-.166
Feel good about self?	-.155	-.381
	Low Dopamine	Low Serotonin
Happy	-.104	.202
Sad	.112	-.215
Strong	.270	.175
Competitive	.104	-.097
Stressed	.318	.353
Worried	.211	.289
Relaxed	-.194	-.218
Intimidated	-.180	-.356
Relieved	.092	-.166
Excited	.209	.272
Frustrated	.181	-.389
Cooperative	.108	-.105

## 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 dysfunction. 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 NAOQ has potential use beyond clinical applications, that is as a research instrument to be used in the study of psychopathology and social cognitive neuroscience. Someone who has been classified on the NAOQ may be part of basic research on human mental processes, normal and abnormal, and it is to this end that the NAOQ 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 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 NAOQ and other instruments, to determine the relationships between students' immediate experience and their scores on the Dopamine and Serotonin-deficit subscales of the NAOQ, 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 NAOQ, 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.

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