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PERSONALITY TRAITS AND REALITY-TESTING ABILITIES, CONTROLLING FOR VIVIDNESS OF IMAGERY

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ABSTRACT

One hundred seventy-seven college students completed personality measures including the MMPI-168, and reality-discrimination measures including a timed discrimination task developed by the first author. Previously on such a timed task, normal subjects discriminated percepts more quickly from images of perceptual vividness than from faint images, as if they registered more "central innervation" during more vivid imaging. Presently, on each of the four practice trials and forty-four timed trials in Task 1, subjects fixated on a dot, perceived a stimulus to one side, imaged an identical stimulus on the other side and rated its vividness while continuing to image. Then, either the dot became a *P* and subjects pressed a button on the side of the *p*ercept, as quickly as possible, or the dot became an *I* and subjects pressed a button on the side of the *i*mage. The slope, within subject, of image/percept discrimination times over image-vividness ratings was computed for the 149 subjects who rated some of their forty-four images more vividly than others. It was predicted and found that self-described hallucinators and MMPI-defined paranoids discriminated percepts *less* quickly from vivid images, as if the greater "central innervation" behind more vivid images is not registered by psychosis-prone subjects.

The present article describes two measures of deficient reality-testing, both of which correlate with personalities that are prone to hallucinate. In previous studies, hallucination-prone personalities have correlated only with the inaccurate discrimination of past percepts and images, which Johnson labels deficient *reality-monitoring* [1, 2], and not with deficient *reality-testing* or the inaccurate discrimination of immediately accessible percepts and images.

In early research on reality testing, Mintz and Alpert reported no statistical association between the trait of hallucination proneness and the accuracy of immediate discrimination, but noted instead that hallucinating was associated with lower correlations between discrimination accuracy and discrimination certainty [3]. Later, in signal-detection experiments, Bentall and Slade confirmed that hallucinators did not exhibit a deficit in the immediate discrimination (d') of verbal signals from imaginal and background noise, but rather, exhibited a criterion-bias (β) classifying most percepts and many images as "certainly perceived" [4, 5].

Nevertheless, in experimental research on reality monitoring, Bentall, Baker, and Havers, as well as Heilbrun, found that hallucination-prone subjects did exhibit greater difficulty in memorially discriminating previously perceived words from self-generated words [6, 7]. However, this association between hallucination proneness and reality-monitoring deficits cannot be attributed to memorial aftereffects of immediate reality-testing deficits, so long as there is no evidence linking hallucination proneness and reality testing.

In seeking such evidence, the present study employs two of Kunzendorf's reality-testing tasks, which control for the fact that hallucinatory images tend to be fainter than normal percepts and just as faint as normal images [8-18]. As Hilgard and Kunzendorf have noted, *faint hallucinations sometimes are inferred to be faint images* (as in reality-testing studies like those above), *and other times are inferred to be ghost-like percepts, but never are immediately known to be self-generated images* [18-20]. In studying the process by which normal images are known to be centrally generated within the self, Kunzendorf has found that *more vivid* and *percept-like* images are not differentiated more slowly from percepts but, paradoxically, are differentiated more quickly from percepts [21, 22]. In explaining this paradox, Kunzendorf hypothesizes that the greater amount of central innervation behind more vividly imaged sensations is registered more quickly and directly by normally functioning brains, but not by hallucinating brains [20-23]. Indeed, in a recent study comparing hypnotic hallucinations and normal images, Kunzendorf confirmed that more vivid hallucinations are no longer differentiated more quickly from peripherally innervated percepts—as if no direct registration of central innervation were taking place in hypnotically hallucinating subjects [22]. Task 1 of this study examines whether, in psychosis-prone subjects also, more vividly imaged sensations are no longer differentiated more quickly from percepts, as illustrated in Figure 1. Task 2 examines whether, in psychosis-prone subjects, visual images are discriminable from percepts of experimentally

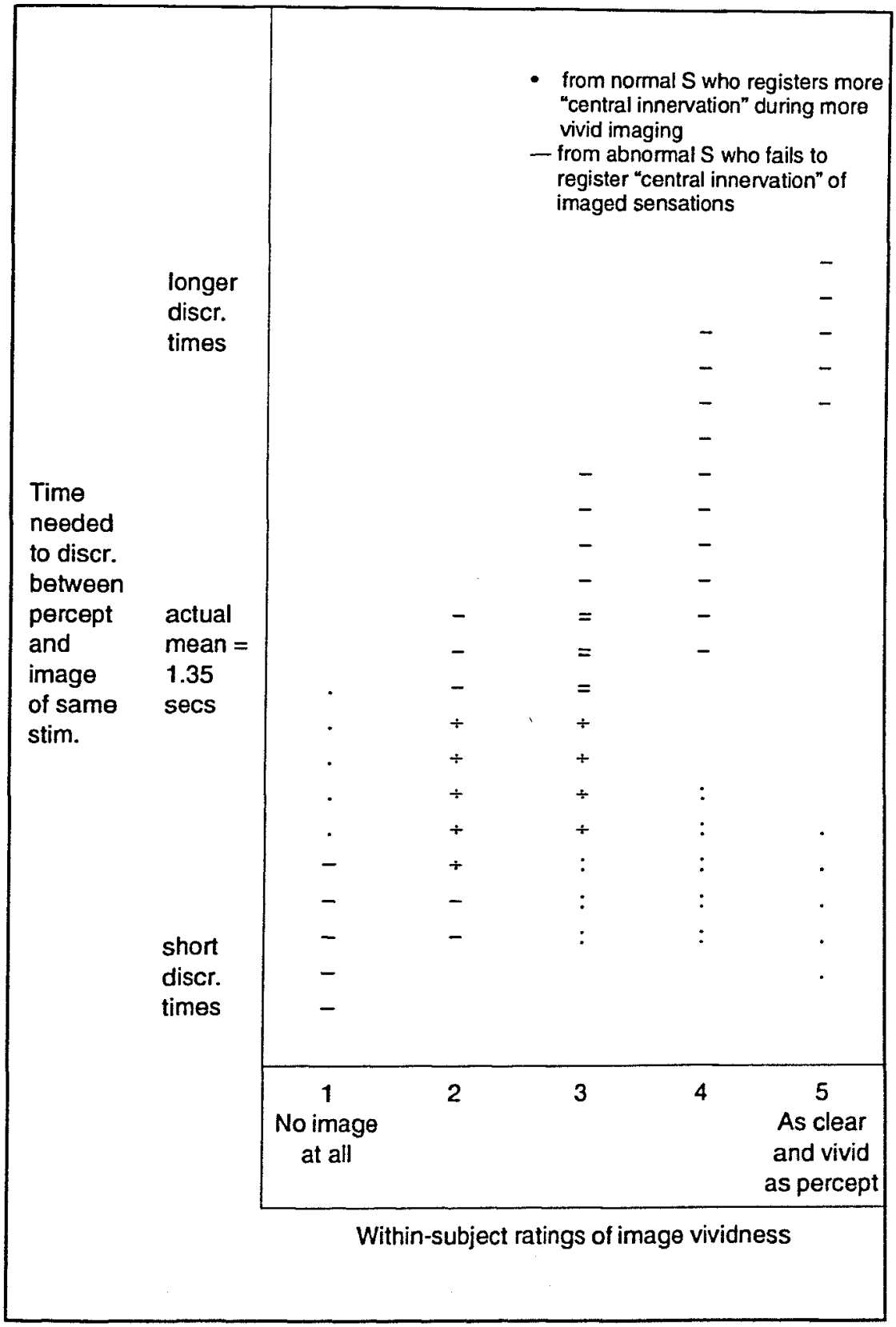

Figure 1. Task 1 predictions: Hypothetical forty-four-trial scattergrams from one normal subject and one abnormal subject.

equalized vividness, whereby it cannot be inferred that the images are insufficiently vivid to be the task's percepts.

For Task 1 and Task 2, psychosis-prone personalities are identified with the paranoia scale (scale Pa) on the short version of the Minnesota Multiphasic Personality Inventory (MMPI=168) [24]. Delusion-prone depressives are identified both with the depression scale (scale D) and with Kunzendorf's "No Meaning" and "Negative Meaning" scales (NoM and NeM [25]), which clarify why some depressives manifest melancholic delusion and others manifest depressive realism [26-30]. Finally, reality-testing abilities on Task 1 and Task 2, both of which are visual tasks, are cross-modally validated with subjects' reports of any *auditory* hallucination during religious fantasy.

METHOD

Subjects

General Psychology students at U. Mass. Lowell were sampled at random and tested for color blindness. One hundred seventy-seven students exhibited normal color vision and served as subjects in the experiment.

Procedure

During 1.5-hour experimental sessions, up to eight subjects at a time were tested at eight computer stations in a darkened laboratory. Each subject completed five individually paced exercises—Task 1, the MMPI-168, the NoM (No Meaning) and NeM (Negative Meaning) Scales, Task 2, and a Religious Fantasy query—in the order just listed, and in the manner described below.

Task 1

Throughout this task (a computerized version of the reality-testing paradigm developed by Kunzendorf [21, 22]), the width of the computer screen was set at forty columns. At the outset of each of the four practice trials and forty-four test trials in Task 1, the bottom of the computer screen contained a fixation point and three green letters (CAR or QUG or RED or NDF),[1] which were vertically

[1] The three letters were supposed to have been green on one half of the trials and red on the other half of the trials, but this programming error was not corrected until the current study was completed and follow-up studies were initiated. In one of the latter studies, four new three-letter stimuli—DIE, ROT, DOA, HIV—replaced the neutral stimuli employed in this study. And in all of the follow-up studies, thirty-two trials were employed instead of forty-eight, for reasons noted at the end of our Results Section.

positioned either six columns to the left of the fixation point or six columns to the right. Initially, the top of the computer screen contained the following instruction:[2]

> Fix your eyes on the asterisk (*) in the middle of the screen. Perceive the 3 colored letters on one side of the screen, and visually image 3 identical letters on the other side. While fixating on the dot, seeing letters on one side and imaging them on the other, rate the image's vividness from 5 to 1:
>
> 5 = perfectly clear and as vivid as the perceived letters;
>
> 1 = no image at all; only thinking of the perceived letters.
>
> Types 5, 4, 3, 2, or 1.
>
> ---
>
> C
> A *
> R

As soon as the subject rated his or her image-vividness, the trial's next instruction appeared:

> Keep fixating on the asterisk, while you perceive 3 letters on one side and image them on the other side. When the asterisk becomes an I, quickly type R if the Right side is Imaged, and S if the left (Sinistral) side is Imaged. Keep imaging until you answer; use your image to answer as quickly as possible. When the dot becomes a P, quickly type R if the Right side is Perceived, and S if the left (Sinistral) is Perceived. As soon as you are fixating and imaging, type S with left index finger, R with right index, SPACE with right thumb.
>
> C
> A *
> R

After the subject typed S and R and space-bar, the instruction disappeared, but the three letters (CAR, e.g.) and the fixation point remained on the screen for three seconds. At the end of three seconds, the three letters still remained on the screen, but the fixation point became either an I for "which is the Image" or a P for "which is the Percept." The computer recorded the subject's response (either an R for "on the Right" or an S for "on the Left"), the response time in hundredths of a second, and the correct response for that trial.

Across the first sixteen trials of Task 1, the four three-letter stimuli (CAR, QUG, RED, NDF) were crossed with the two stimulus positions (left of fixation, right of fixation), and the two stimulus queries (I for "which is the Image," P for

[2] The actual instruction assigned "5" to "no image at all" and "1" to "perfectly clear and . . . vivid," in accordance with Marks' Vividness of Visual Imagery Questionnaire [32]. For purposes of clarity, this assignment has been reversed in the following instruction, in Figure 1, in all data analyses and tables (and in all follow-up studies).

"which is the percept"). These sixteen counterbalanced conditions were repeated, in a random order, across the next sixteen trials and the last sixteen trials. After all four practice trials and all forty-four test trials were completed, the MMPI-168 was then initiated.

MMPI-168

On this short version of the Minnesota Multiphasic Personality Inventory, each subject responded True or False to the first 168 items. From MMPI-168 scores on the ten basic clinical scales, estimates of corresponding MMPI scores were computed with Overall and Gomez-Mont's regression equations [24], and *T*-scores for the estimated scores were derived from Dahlstrom, Welsh, and Dahlstrom's *T*-score conversion table [33, Table 1].

NoM and NeM Scales

Subsequently, every subject completed Kunzendorf's NoM (No Meaning) and NeM (Negative Meaning) Scales. Scores on the NoM Scale increase with existential authenticity from eighteen to seventy-two, based on eighteen existential statements that are rated from 1 = "strongly disagree" to 4 = "strongly agree." Scores on the NeM Scale increase with delusory negativity from eighteen to seventy-two, based on eighteen statements expressing negative meaning. These previously unpublished scales, which are reproduced in Appendices A and B, proved to be statistically reliable scales in a pilot study with 192 subjects (Cronbach's $\alpha = .892$ and .894) [25].

Task 2

Throughout this two-phase task, developed by Kunzendorf, Carrabino, and Capone [31], computer screens generated the only light in the laboratory. In the first phase, each subject adjusted the vividness of colored circles on the screen, until they matched the vividness of a circle imaged by the subject. In the second phase, the subject attempted to discriminate between a circular percept, the vividness of which was controlled in this manner, and a circular image.

At the beginning of the first phase, the bottom of the computer screen displayed three filled circles—a red circle on the left, a green circle in the center, plus a yellow circle on the right—and the top of the computer screen displayed the following instruction:

> Take a good look at the red, green, and yellow circles. When you have taken a good look, press G and the green circle will go away. With the green circle gone, try visually to imagine that there is still a green circle between the red and yellow circles. Image the green circle to be as VIVID as the two circles still on the screen. If your imaginary circle is less vivid than the other two, then turn down the CONTRAST KNOB (the closer knob) on the left side of the monitor, until the image is as vivid as the other two circles. When your

Table 1. Task 1 Results: Mean Within-S Slope (Regression Coefficient for Forty-four Image/Percept Discrimination Times over Forty-four Image-Vividness Ratings) Broken Down by MMPI-168 Scales and T-scores

Clinical Scales		T<50	50≤T<60	60≤T<70	70≤T<80	80≤T
MMPI scale Hs	Slope	−.6	−4.6	−5.3	4.6	23.7>
	[*S*]	[55.1]	[47.6]	[36.8]	[32.1]	[35.8]
	[*n*]	[49]	[60]	[22]	[9]	[9]
MMPI scale D	Slope	−13.7<	2.6	−6.1	19.2	7.7
	[*S*]	[40.6]	[54.2]	[32.8]	[67.0]	[33.2]
	[*n*]	[35]	[51]	[35]	[16]	[12]
MMPI scale Hy	Slope*	−14.8<<	4.8	17.4	−3.1	
	[*S*]	[46.0]	[44.5]	[53.0]	[44.5]	
	[*n*]	[55]	[60]	[23]	[11]	[0]
MMPI scale Pd	Slope	−2.9	−8.5	8.3	13.9	
	[*S*]	[52.9]	[39.6]	[52.2]	[42.7]	
	[*n*]	[54]	[53]	[25]	[17]	[0]
MMPI scale Mf	Slope*	−6.7	−2.1	14.4	39.2	
	[*S*]	[48.0]	[42.0]	[56.3]	[44.1]	
	[*n*]	[74]	[53]	[17]	[5]	[0]
MMPI scale Pa	Slope*	−9.8<	−1.8	1.5	1.1	27.4>>
	[*S*]	[40.7]	[53.5]	[55.5]	[42.1]	[31.7]
	[*n*]	[48]	[44]	[25]	[20]	[12]
MMPI scale Pt	Slope	−6.5	1.2	−1.7	17.7	9.4
	[*S*]	[53.7]	[30.5]	[43.4]	[65.1]	[35.7]
	[*n*]	[68]	[33]	[27]	[11]	[10]
MMPI scale Sc	Slope	−5.0	−3.2	−6.9	11.2	11.1
	[*S*]	[63.9]	[37.6]	[35.7]	[68.5]	[36.9]
	[*n*]	[33]	[51]	[31]	[14]	[20]
MMPI scale Ma	Slope*	−13.2<	−1.5	5.4	11.2	
	[*S*]	[39.8]	[50.9]	[53.0]	[32.2]	
	[*n*]	[36]	[58]	[38]	[17]	[0]
MMPI scale Si	Slope	−4.1	12.9			
	[*S*]	[46.0]	[52.6]			
	[*n*]	[123]	[26]	[0]	[0]	[0]

*Linear increase of slope across higher T-score groupings, two-tailed $p < .05$.
<Less than zero slope, one-tailed $p < .05$.
<<Less than zero slope, one-tailed $p < .01$.
>Greater than zero slope, one-tailed $p < .05$.
>>Greater than zero slope, one-tailed $p < .01$.

> image seems equally vivid, KEEP THAT CONTRAST until told otherwise and call the experimenter to CONTINUE.

The three circles—each 20 points in diameter—were horizontally separated by 5 points, and from left to right, were filled by Colors 2, 1, and 3 of BASICA Palette 0. The medium-resolution background was Color 13 (light magenta), which made Color 3 appear yellow rather than brown. At the outset of the experiment, the screen was set at maximum contrast, minimum brightness, and the illuminance of the yellow circle was maximized at 215 lux. After the subject lowered the contrast to match his or her imagery, the yellow circle was covered with the probe of an Edmund Scientific lux meter, and the circle's illuminance was entered in the computer as an image-vividness score. Thus concluded the first phase.

Thereafter, as the second phase commenced, the green circle reappeared between the red and yellow circles, and the following instruction appeared:

> Take another good look at the red, green, and yellow circles. In a moment you will be instructed to close your eyes and vividly image the three circles. While imaging the three circles with your eyes closed, you will hear a BEEP. As soon as you hear the beep, open your eyes while continuing to image the three circles, AND MERGE YOUR IMAGINARY CIRCLES WITH THE REAL CIRCLES. Keep imaging until the screen turns black. Reread these instructions if necessary. Immediately before you close your eyes and image the three circles, press C.

Three seconds after the subject pressed the letter "C," the red circle disappeared from the screen, and the computer beeped the subject to open both eyes and to merge the three imaginary circles with the real circles—only two of which remained on the light magenta background. Then, three seconds after the beep, the green and yellow circles also disappeared from the screen, and on a black background, the following succession of questions appeared one after another:

> NOW TURN THE CONTRAST ALL THE WAY UP
> After you opened your eyes, how many circles did you see? (Type 0-5)
> .....
> After you opened your eyes, one of the three circles was no longer on the screen. To the best of your knowledge, which of the three circles was no longer on the screen after you opened your eyes? (Press R for the red circle, G for the green circle, or Y for the yellow one.)
> How certain are you? (Type V for very certain, C for certain, N for not certain)
> .....
> After you opened your eyes, was the red or green or yellow circle less vivid than the other circles? (Answer Y or N)

If Y, which circle was less vivid? (Type R for the red circle, G for the green circle or Y for the yellow one)

The first question in this succession served to differentiate normal reality-testers who reportedly saw two circles, the number of real circles, from hallucination-prone subjects who reportedly saw a third circle. It also served to screen out subjects who reportedly saw zero circles, presumably because they failed to open their eyes before the background turned black. The middle questions (which were scored "1 = very certain red," "2 = certain red," "3 = not certain red". . . "6 = very certain yellow or very certain green") served to determine whether proneness to hallucinate a third circle was attributable to a true discrimination failure or a mere response bias. The last question served to screen out subjects whose red imagery was not as vivid as the green and yellow screen, either because they failed to turn down the screen's contrast sufficiently or because they failed to image.

Religious Fantasy

Finally, each subject answered the following query:

During prayer . . .
A = . . . I have heard God speak to me.
B = . . . I have not heard God, but have imagined hearing God speak to me.
C = . . . I have neither heard nor imagined God speaking to me.

RESULTS

Table 2 displays the means and standard deviations of three Task 1 variables and three Task 2 variables, broken down by whether subjects classified themselves as auditory hallucinators, auditory imagers, or auditory nonimagers during religious fantasy. On Task 1, the hallucinators' discriminations of visual percepts from images were no less accurate; rather, the hallucinators' percepts were discriminated more slowly from vivid images than from faint images (regression coefficient = 33.3), *as if the hallucinators failed to register the greater amount of "central innervation" in more vivid images.* On Task 2, the hallucinators were no more likely to "see" three circles while merging three imaged circles with two actually seen circles (probability = .20), but were more likely *not to know* that the circle being imaged and not perceived was red (level of not knowing = 4.3 out of 6.0).

Table 3 reports the correlations among the three Task 1 variables, the three Task 2 variables, and the ten MMPI-168 scales. It is noteworthy that subjectively rated image-vividness on Task 1 and objectively matched image-vividness on Task 2 were not significantly correlated with any personality scales on the MMPI-168, but were positively correlated with each other ($r = .23$). On Task 1, less correctness of image/percept discriminations was not significantly correlated with any

Table 2. Task 1 and Task 2 Validation: Means of Image-Vividness and Reality-Testing Variables, Broken Down by Reports of Auditory Hallucination during Religious Fantasy

	Task 1/Variable 1	Task 1/Variable 2	Task 1/Variable 3	Task 2/Variable 1	Task 2/Variable 2	Task 2/Variable 3
	Mean vividness of 44 Images, Rated from 1-5 (5 = as clear and vivid as percept)	Proportion of 44 Image/Percept Pairs That Were Discriminated Incorrectly	Within-S Slope (Regr. Coeff.) for Discr.-time over Vividness, as in Figure 1	Image-vividness Objectively Matched against CRT Illuminance (in Lux)	Prob. of "seeing" 3 Circles while Merging 3 Imaged Circles with 2 Truly Seen Ones	Color of Unseen Circle *Not* Known to be Red (1 = known; 6 = *not* known to be red)
Subjects who "have heard God speak to [them]"	$M = 2.3$ [$S = 1.1$] [$n = 9$]	$M = .45$ [$S = .21$] [$n = 9$]	$M = 33.3$> [$S = 50.1$] [$n = 9$]	$M = 31.2$ [$S = 45.2$] [$n = 5$]	$M = .20$ [$S = .45$] [$n = 5$]	$M = 4.3$* [$S = 1.9$] [$n = 5$]
Ss who "have imagined hearing God speak"	$M = 2.5$ [$S = 1.2$] [$n = 61$]	$M = .28$ [$S = .23$] [$n = 61$]	$M = -6.2$ [$S = 56.5$] [$n = 61$]	$M = 61.3$ [$S = 71.6$] [$n = 51$]	$M = .31$ [$S = .47$] [$n = 51$]	$M = 2.3$ [$S = 1.6$] [$n = 51$]
Ss who "have neither heard nor imagined hearing God"	$M = 2.2$ [$S = 1.1$] [$n = 79$]	$M = .27$ [$S = .24$] [$n = 79$]	$M = -1.1$ [$S = 37.4$] [$n = 79$]	$M = 52.9$ [$S = 62.4$] [$n = 69$]	$M = .31$ [$S = .47$] [$n = 69$]	$M = 2.4$ [$S = 1.8$] [$n = 69$]

>Significantly greater than zero slope, $t(8) = 1.99$, one-tailed $p < .05$, and significantly different from mean slope of the other 140 subjects, $F(1,146) = 5.29$, $p < .05$.

*Significantly different from mean "not known to be red" rating of the other 120 subjects, $F(1,123) = 4.75$, $p < .05$.

Note: On Task 1, the within-S slope (Variable 3) could only be computed for those subjects who rated some of their forty-four images more vividly than others. On Task 2, the probability of "seeing" three circles (Variable 2) should only be computed for those subjects who saw at least two circles and confirmed that their image of the red circle was not less vivid than the two perceived circles. Thus, in the above analyses and in subsequent analyses, all Task 1 statistics are based on 149 subjects, and all Task 2 statistics are based on 125 subjects. Also in all analyses, the within-S slope (Task 1/Variable 3) represents slope corrected for mean discrimination time.

Table 3. Task 1 and Task 2 Results: Correlations among Image-Vividness Variables, Reality-Testing Variables, and MMPI-168 Scales

	Task 1/Variable 1	Task 1/Variable 2	Task 1/Variable 3	Task 2/Variable 1	Task 2/Variable 2	Task 2/Variable 3
	Mean vividness of 44 Images, Rated from 1-5 (5 = as clear and vivid as percept)	Proportion of 44 Image/Percept Pairs That Were Discriminated Incorrectly	Within-S Slope (Regr. Coeff.) for Discr.-time over Vividness, as in Figure 1	Image-vividness Objectively Matched against CRT Illuminance (in Lux)	Prob. of "seeing" 3 Circles while Merging 3 Imaged Circles with 2 Truly Seen Ones	Color of Unseen Circle *Not* Known to be Red (1 = known; 6 = *not* known to be red)
Task 1/Var. 1		.15	−.27*	.23*	−.02	−.09
Task 1/Var. 2	.15		.01	.01	−.05	.22*
Task 1/Var. 3	−.27*	.01		−.16	−.09	.23*
Task 2/Var. 1	.23*	.01	−.16		.00	−.10
Task 2/Var. 2	−.02	−.05	−.09	.00		.13
Task 2/Var. 3	−.09	.22*	.23*	−.10	.13	
MMPI scale Hs	.10	.09	.03	.08	.02	−.08
MMPI scale D	−.02	.03	.09	.15	.14	−.03
MMPI scale Hy	.02	.09	.16*	.10	.02	−.06
MMPI scale Pd	−.01	.08	.10	.10	.12	−.01
MMPI scale MF	−.07	.01	.11	.01	.14	−.03
MMPI scale Pa	−.01	.04	.20*	.02	.19*	.05
MMPI scale Pt	−.03	.12	.13	.08	.18*	−.02
MMPI scale Sc	−.03	.07	.07	.02	.20*	.02
MMPI scale Ma	−.01	.07	.11	.08	.08	.02
MMPI scale Si	.04	.04	.08	.15	.25*	−.07

*Significantly different from zero correlation, two-tailed $p < .05$.

MMPI-168 scale, but slower discrimination-time for more vivid imagery was positively correlated with the Hysteria scale (r = .16) and, as predicted, the Paranoia scale (r = .20). On Task 2, reportedly "seeing" a purely imaginary circle was positively correlated with the Paranoia scale (r = .19), the Psychasthenia scale (r = .18), the Schizophrenia scale, (r = .20), and the Social Introversion scale (r = .25); however, failing to differentiate the purely imaginary circle from other circles, by color, was not significantly correlated with any MMPI-168 scale.

For purposes of clarifying the Task 1/Variable 3 correlations in Table 3, Table 1 breaks down the actual slopes by MMPI-168 scales and T-scores. This breakdown reveals significant increases in slope across hysteria T-scores, masculinity/femininity T-scores, paranoia T-scores, and hypomania T-scores. Most significantly, on the MMPI paranoia scale (Pa), the least paranoid subjects had a negative slope (-9.8, indicating that they registered more "central innervation" during more vivid imaging), and the most paranoid subjects had a positive slope (27.4, indicating that they failed to register the greater amount of "central innervation" in more vivid images).

Table 4 breaks down scale D slopes even further, by whether subjects scored higher on the No Meaning Scale or the Negative Meaning Scale. Only the most depressed subjects scoring higher on Negative Meaning (NeM) had positive slopes (44.0 and 21.1, indicating that they also failed to register the greater amount of "central innervation" in more vivid images).

It should be noted that the results for Task 1/Variable 3 turn out substantially the same when only two-thirds of the Task 1 trials (i.e., only the first 32 trials) are analyzed. Accordingly, Kunzendorf's future experimentation with Task 1 will employ four practice trials and twenty-eight test trials.

DISCUSSION

The results of one of the reality-testing exercises, Task 2, seem to support Bentall and Slade's hypothesis [5]: that hallucination-prone subjects are biased toward interpreting both imaginal and perceptual sensations as percepts (Task 2/Variable 2), but are no less able to discriminate images from percepts (Task 2/Variable 3). Despite this appearance of response bias on Task 2, the results of Task 1 provide clear support for Kunzendorf's hypothesis [20, 23]: that psychosis-prone subjects are unable to register the "central innervation" of hallucinated sensations (Task 1/Variable 3), even though they can indirectly infer the imaginal origins of any visual hallucination fainter than a percept (Task 1/Variable 2). Indeed, the inability to register the greater "central innervation" of more vivid images on the timed-discrimination task (i.e., a positive slope on Task 1/Variable 3) seems to be the most valid of the four experimental variables pulling for deficient reality-testing, because it was associated not only with higher paranoia in Table 1 and Table 3, but also with auditory hallucination itself in Table 2. The reason why positive slope was not also associated with schizophrenia

Table 4. Task 1 Depression Results: Mean Within-S Slope (Regression Coefficient for Forty-four Image/Percept Discrimination Times over Forty-four Image-Vividness Ratings), Mean NoM ("No Meaning" Score), and Mean NeM ("Negative Meaning" Score) Broken Down by T-Scores for Depression and by NoM versus NeM Salience

		T-scores from Scale D of MMPI-168				
		T<50	50≤T<60	60≤T<70	70≤T<80	80≤T
"No meaning" salient (NoM-NeM>median)	Slope	–8.9	2.2	–4.2	4.3	–11.2
	[*S*]	[36.5]	[24.6]	[29.8]	[73.1]	[39.5]
	[*n*]	[18]	[18]	[16]	[10]	[5]
	NoM*	25.2	29.9	39.9	41.5	42.3
	[*S*]	[4.2]	[8.1]	[11.4]	[15.0]	[12.5]
	NeM*	19.1	22.5	28.2	28.7	32.1
	[*S*]	[1.3]	[5.8]	[9.4]	[7.9]	[8.3]
"Neg. meaning" salient (NoM-NeM≤median)	Slope*	–18.8	2.7	–7.8	44.0>	21.1>>
	[*S*]	[45.0]	[65.3]	[35.8]	[51.8]	[21.6]
	[*n*]	[17]	[33]	[19]	[6]	[7]
	NoM*	21.1	21.5	25.6	33.3	35.3
	[*S*]	[3.0]	[4.0]	[12.2]	[12.6]	[13.3]
	NeM*	21.9	21.9	29.0	34.2	39.7
	[*S*]	[5.4]	[4.8]	[12.0]	[13.2]	[13.2]

*Linear increase across higher T-score groupings, two-tailed $p < .05$.
>Greater than zero slope, one-tailed $p < .05$
>>Greater than zero slope, one-tailed $p < .025$.
Note: The median difference for NoM minus NeM scores was 2.

T-scores over eighty might be because higher Sc scores in college students tend to reflect alienation and confusion, rather than psychosis [33], or because Sc scores on the MMPI-168 tend to overestimate Sc scores on the MMPI [34]. In either case, our use of the MMPI-168 with college students imposes psychometric and theoretical limitations on the statistical power of Task 1/Variable 3. Previously, in seven psychometric studies with sample sizes of 100 to 161 subjects, the correlations between MMPI clinical scores and MMPI-168 scores have ranged between .66 and .98 [35]. And from our own theoretical standpoint, the tendency of psychosis-prone students to exhibit positive slope on Task 1/Variable 3 should be less strong than the tendency of psychotic patients to do likewise.[3]

[3] In addition, whereas both psychosis-prone students and psychotic patients should *fail to register the greater "central innervation" of more vivid images* on Task 1/Variable 3, only psychotic patients should *fail to infer image/percept differences* on Task 1/Variable 2.

Notwithstanding such limitations, positive slopes on Task 1/Variable 3 were, also, statistically associated with more psychotic depression in Table 4, with stronger mania in Table 1, with greater sexual inversion in Table 1, and with more severe hysteria in Table 3 and Table 1. All four of these personality dimensions and their relations to deficient reality-testing are discussed in succession below.

In cases of depression, deficient reality-testing is associated only with the psychotic delusion of negative meaning (NeM) and not with the existential reality of no meaning (NoM), in accordance with evidence for negative distortion in some depressives and depressive realism in others [26-30]. By implication, when auditorily imagining voices inside the head that urge suicide, psychotically depressed people with no immediate reality-testing can defensively *infer* that the voices are beamed into the head by the C.I.A. or the devil, whereas existentially depressed people with normal reality-testing can only *register and know* that the voices are their own. Similarly, when faintly visualizing a recently decreased relative in a hoped-for afterlife, psychotically depressed people can delusively *infer* that they are seeing the relative's ghost, whereas realistically depressed people can only *register and know* that such hopeful sensations are self-generated fantasies. Even when psychotic people infer that an hallucination is too faint or too "inside the head" to be anything but an image, they do not immediately register the greater amount of "central innervation" behind more vivid imagery—whether it be threatening imagery like that just described, or benign imagery such as that employed in the current experiment.

For hypomania and masculinity/femininity *T*-scores higher than eighty, positive slopes on Task 1/Variable 3 may be extrapolated from the statistically significant regression coefficients. Given that mania and psychosis are associated in psychiatric diagnosis [36], and given that sexual inversion and paranoia are associated in our culture [37, 38], it would not be surprising if future studies of higher *T*-scores confirm these extrapolations.

Finally, interesting theoretical possibilities are raised by the finding that, for hysteria *T*-scores above eighty, a positive slope on Task 1/Variable 3 also may be extrapolated. Empirically, this extrapolated association between more severe dissociation and reality-testing deficiency is supported by Kluft's and Pokrajac's observations of Schneiderian first-rank symptoms in patients with Multiple Personality Disorder [39, 40]. Thus theoretically, psychosis and dissociation might involve the same inability to register the *source of sensations*—the *"central innervation" of imaginal sensations* on one hand, and the *"peripheral source" of perceptual sensations* on the other hand. However, whereas psychosis seems to be initiated by "unregistered" images that are traumatic and are defensively inferred to be perceptual, dissociation seems to be initiated by "unregistered" percepts that are traumatic and are defensively inferred to be images. Initially in cases of psychosis, for example, depressed persons might defensively *infer* that their "unregistered" *images* of suicidal urges are satanically generated rather than self-generated, and paranoid persons might defensively *infer* that their

"unregistered" *images* of homoerotic urges are C.I.A.-generated rather than self-generated. In contrast, dissociated persons might defensively *infer* that their "unregistered" *percepts* of abuse are fleeting dream-like images rather than memorially important realities (as Bliss and Kunzendorf find [41, 42]), and might secondarily experience image-registration deficiencies. A question that remains, for hallucinated images and for dissociated percepts independently, is whether the underlying deficiencies in reality-testing develop from past traumas, genetic propensities, their interaction or their combination [43].

APPENDIX A
NoM (No Meaning) Scale

Please rate each statement below, by circling one of the ratings 1-4. Circle *'1' if you strongly disagree*, '2' if you mildly disagree, '3' if you mildly agree, or *'4' if you strongly agree.*

1 2 3 4 It does not matter whether I live or die.

1 2 3 4 The fact that I shall die and be forgotten makes my life seem insignificant.

1 2 3 4 The possibility that death may terminate my awareness of having ever existed at all makes my existence seem meaningless.

1 2 3 4 My place in the universe is like that of an insignificant speck of dust.

1 2 3 4 Life has no meaning or purpose.

1 2 3 4 Any perceived meaning in life is illusory.

1 2 3 4 All strivings in life are futile and absurd.

1 2 3 4 The likelihood that I shall be remembered by no one in two hundred years makes my current life seem unimportant.

1 2 3 4 All suffering is pointless.

1 2 3 4 Life is a cruel joke.

1 2 3 4 Heroic deeds stem from the delusion that they are meaningful and significant.

1 2 3 4 Life is filled with one absurd loss after another.

1 2 3 4 Taking care of one's health is pointless, as it will not avert one's rendezvous with death.

1 2 3 4 To perpetuate life by having children of one's own is merely to perpetuate absurdity and loss of life.

1 2 3 4 When you really think about it, life is not worth the effort of getting up in the morning.

1 2 3 4 Whenever I have experienced loss (of a deceased relative, or an estranged lover, or a squandered opportunity), I felt that life lost some of its meaning for me.

1 2 3 4 I just don't care about myself any more.

1 2 3 4 There is no sense in feeling hopeful about the future because, in the end, death robs life of all meaning anyway.

APPENDIX B
NeM (Negative Meaning) Scale

Please rate each statement below, by circling one of the ratings 1-4. Circle *'1' if you strongly disagree*, '2' if you mildly disagree, '3' if you mildly agree, or *'4' if you strongly agree.*

1 2 3 4 Most of my suffering is punishment that I deserve.

1 2 3 4 I often feel like I deserve to be punished.

1 2 3 4 When I reflect on the shortcomings in my life, I am overwhelmed with guilt.

1 2 3 4 When I reflect on the shortcomings in my life, I begin to hate myself.

1 2 3 4 I feel responsible for the evil within me.

1 2 3 4 My fate in life is to suffer for the shortcomings in myself and others.

1 2 3 4 Whenever I have experienced loss (of a deceased relative, or an estranged lover, or a squandered opportunity), I felt that I was being punished.

1 2 3 4 When you really think about it, most of our motives and actions are detestable.

1 2 3 4 I really hate myself these days.

1 2 3 4 There is no sense in feeling hopeful about the future, because all dreams are unattainable illusions, and all hopes end in disappointment and disillusionment.

1 2 3 4 My own motives and actions are detestable.

1 2 3 4 Compared to other people, I am a worthless human being.

1 2 3 4 Other people deserve to be happy; I do not.

1 2 3 4 It is unlikely that I shall ever be as happy as other people.

1 2 3 4 Other people 'bounce back' from their failures, but I am incapable of doing so.

1 2 3 4 By not doing enough to put an end to evil in the world, I feel that I am responsible for it.

1 2 3 4 I feel that I am a failure because I have done so little to eradicate evil.

1 2 3 4 I am unattractive to other people, and I always will be.

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