The International Journal of Indian Psychology
ISSN 2348-5396 (e) | ISSN: 2349-3429 (p)
Volume 5, Issue 1, DIP: 18.01.053/20170501
DOI: 10.25215/0501.053
http://www.ijip.in | October-December, 2017

The International Journal of INDIAN PSYCHOLOGY

Original Research Paper

The Diagnostic Utility of Kent-Rosanoff Word Association Test In relation to Response Entropy

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ABSTRACT

Kent-Rosanoff word association test was administered and scored for: one index of response entropy and seven categories of emotional indicators for each of the 100 stimulus words (N=250). The inference suggests that the diagnostic utility of Kent-Rosanoff word association test should be viewed with due regard to the relationship of emotional indicators and response entropy. Therefore, to validate the findings, a homogenous list of 68 stimulus words of average response entropy of Kent-Rosanoff word association test were selected and administered to psychiatrically diagnosed 8 paranoid schizophrenics, 10 non-paranoid schizophrenics, 10 non-psychotic psychiatric patients and 250 normal. Results reveal strong justification for the clinicians to use the joint occurrence of emotional indicators 'unique response-long reaction time-response repetition' and 'unique response-long reaction time-misremembering' for tapping a common factor associated with the willingness to be unconventional. The 'diagnostic potential' of the list of 68 homogeneous stimulus words has been confirmed to a great extent.

Keywords: *Response Entropy, Word Associations, Diagnostic utility and Emotional Indicators.*

The word association method, first introduced by Francis Galton (1879) is one of the oldest procedures used in personality assessment and may well be considered a forerunner of the most recent projective techniques. Subsequently it was developed by Carl Jung and Kent-Rosanoff as a diagnostic tool. Kent-Rosanoff (1910) Word Associations Test (K-R WAT) is still in use today, although the method is distinctly less popular among clinical psychologists and psychiatrists than it was between 1910 and 1945 (Vernon, 1953, Pp 172-175; Cf. Gough, 1976). Investigators (Hull and Lugoff 1921; Rapaport et al. 1946; Sarason,1959,1961; Brown1965,1970; Lisman and Cohen,1972; DeWolfe and Youkilis,1974; Hundal and Upmanyu 1974; Kuntz,1974; Penk and Kidd,1977; Penk 1978; Shakow,1980; Miller and Chapman,1983; Upmanyu and Upmanyu,1988; Upmanyu, Bhardwaj and Singh,1996; Singh,

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Received: October 16, 2017; Revision Received: November 03, 2017; Accepted: November 23, 2017

Panda and Upmanyu,1998; Upmanyu et al, 2010) have found evidence in favor of word association technique for studying emotional disturbance. Uncommon word associations have long been valued as indicators of schizophrenic thought disorder.

Despite the promise of pioneering work contrasting normal and clinical groups (Kent-Rosanoff, 1910), many attempts to relate word association indices to personality traits in normal groups have generally failed. Evidence has been presented by various researchers (Meyers and Brecher, 1941; Appelbaum, 1960; Goldstein, 1961; Tecca and Glassco, 1965; Storms et al. 1967; Fuller and Kates,1969; Andress et al. 1974) to the effect that word association tests failed to differentiate between normal and deviant subgroups. They questioned the utility of word association tests as diagnosis tool. Schwartz (1978a, 1978b) has questioned the entire published evidence that schizophrenics give rarer associates than normal subjects. At the same time, other investigators (Brow, 1965; Hundal and Upmanyu, 1974; and Kuntz, 1974) presented that behavioral indices are associated with the difficulty of finding an appropriate response to the verbal stimuli. In these studies, the associative difficulty of each word was defined in terms of and measured by the procedure of counting the number of unique responses made to that word by the subjects of the group. A response was defined as unique if it was made by 1 percent of the subjects. Thus, a stimulus word eliciting many unique responses will have high associative difficulty. It implies that for a stimulus word with high associative difficulty, a wide range of alternative associations is possible, which in turn is a precondition for high response entropy. In the light of this explanation, response entropy and associative difficulty seem to overlap each other. The difference, however, refers to the fact that in associative difficulty, only the number of unique responses are counted, whereas response entropy takes into account the total number of different responses to a stimulus word (including unique responses) as well as the proportion of subjects giving each response.

Working in the same area Upmanyu, (1981) concluded that: (1) response entropy and unique response are fairly overlapping concepts; (2) the long reaction time is positively and significantly related with response entropy and its utility as an emotional indicator should be viewed in the light of its relationship with response entropy; (3) repetition of the stimulus before responding, misremembering, forgetting and response repetition, as indices of emotional disturbance are free from the confounding influence of response entropy.

In psychoanalytic literature, the notion is sometimes expressed or implied that when a stimulus word evokes a single complex sign, no particular significance is to be attached to it, but if two or more signs appear at the same time, the combination at once becomes decidedly significant (Dooley, 1916). A further possibility was indicated by Smith (1922) when he wrote that “prolongation of reaction time alone is not necessarily a complex-indicator, it is only significant if accompanied by other indicators” (p.65). Hull & Lugoff (1921) and Brown (1965) researchers revealed that some emotional indicators tend to co-occur, but failed to explore the common determinant for want of external measures of emotional disturbance. More recently, Upmanyu & Singh, (1995) and Upmanyu et al. (2010) studied the importance

of simultaneous occurrence of word association emotional indicators on normal subjects and concluded that the joint occurrence of long reaction time (LRT) and repetition of stimulus before responding (RSBR) are useful for diagnosing suspiciousness. Simultaneous occurrence of unique response, long reaction time and misremembering (UR-LRT-W) emerged to be a more valid criterion for both psychosis proneness and psychopathic deviation.

Efforts are still in progress to understand the correlates of word association test responses. Present investigation intends to study the relationship between response entropy and emotional indicators so that if necessary the influence of response entropy is controlled. Secondly, it proposes to validate the performance of controlled Kent-Rosanoff word association test on psychiatrically diagnosed patients. It is hoped that the validity of the findings on psychiatrically diagnosed population, if established, would lend credence to the belief that the word association technique can provide valuable information concerning psychiatric disturbance.

METHODOLOGY

Sample

Subjects for this investigation were 250 male students drawn from different Senior Secondary Schools functioning under the Directorate of Education Govt. NCT of Delhi (India). Rationale for limiting the present study to males was mainly convenience, besides the need to control the sex variable. Only XI and XII grade students were selected to control the influence of education level. Age of the subjects ranged from 16 to 19 years with a mean and standard deviation of 16.48 and 1.01 years, respectively.

Only male psychiatrically diagnosed patients were used to validate the findings. They were: (1) 8 paranoid schizophrenics with mean age 34.7 years (range 18-52 years, SD 10.6) and mean education 11.2 years (range 10-16 years, SD 1.31 years); (2) 10 non schizophrenics, with a mean age 33.8 years (range 20-51 years, SD 10.0) and mean education 12.0 (range 9-16 years, SD 1.56 years); (3) 10 non-psychotic psychiatric patients with a mean age 31.4 years (range 18-45 years, SD 9.3) and a mean education of 12.4 years (range 10-16 years, SD 1.20). These patients were obtained from Dr. Ram Manohar Lohia Hospital, New Delhi. Criterion for inclusion in the subject pool were: less than one year of total hospitalization, no evidence of organicity or retardation, and no history of electroconvulsive therapy. Patients capable of functioning in the community were selected in an attempt to control for effect of hospitalization, isolation and so on. Here it is important to mention that the three groups of psychiatric patients did not significantly differ in education and age. However, it is apparent that there was some confounding of age with the normal controls being younger in age. Ideally, this confounding should have been controlled. Despite this, the findings would indicate the trend pertinent to the validity of findings revealed by the normal subjects.

Instruments

Kent-Rosanoff Word Association Test (Kent-Rosanoff, 1910)

The test consists of 100 common words, mostly nouns and adjectives. The norms were prepared on 1000 normal adults. The test has retained its position as standard laboratory technique. During the administration, the subject is required to give as quickly as possible, the first word that he can think of in response to each stimulus word presented by the experimenter. The word associations can be scored to diagnose emotional disturbance of the subjects.

Administration of Kent-Rosanoff Word Association Test

Word association test was administered to one subject at a time. In every testing session, after a few minutes of informal talk and in an atmosphere made as casual and relaxed as possible, the subject was given a sheet of paper with the following instructions, which were read out loud for the subject.

"I am going to read a list of words. After each word I read, say the first word that comes toyour mind. The word may or may not be related to the word I speak. For example, I might say the word 'bazaar' and you might think of the word 'shop' or 'street' or 'man' in the first instant. I would like you to give the response as quickly as possible, since I am going to note down the time taken by you for giving the response. Do you have any questions?"

If the subject indicated that he did not understand, the investigator repeated the appropriate part of the instructions. Practice was given on five words which were not included in the K-R WAT. The 100 stimulus words of the list were read off one at a time. The subject's response, reaction time and reactions, such as repetition of stimulus word before giving the response and failure to make any response, were noted.

After completion of the list, the investigator gave the following instructions:

> "I am going to present the same list of words again. After each word that I speak, try to give the same response word that you gave during the first presentation of the list. For example, if I had said 'bazaar' and you had responded 'shop' on the first presentation of the list, then this time also you should say 'shop' after I speak the word 'bazaar'. For this purpose, you may take as long as you wish."

The 100 words of the list were again read off in the same order and only one at a time. Emotional indicators such as forgetting and misremembering were recorded.

Scoring of Kent-Rosanoff Word Association Test

Word association test was scored to identify the position of the subjects on the following emotional indicators:

1. **Unique Responses (UR)**

Any response made by less than 1 percent of the subjects to a particular stimulus word was scored as unique response.

2. **Moderately Infrequent Responses (UR$^{/}$)**

Any response made by 1 percent to 9.9 percent was scored as moderately infrequent response.

3. **Long Reaction Time (LRT)**

Following Laffal (1955) a reaction time of 2.6 seconds or longer was scored as long reaction time.

4. **Repetition of the Stimulus Before Responding (RSBR)**

This indicator was scored when subject repeated the stimulus word before giving the Response.

5. **Forgetting (Fg.)**

This indicator was scored when subject indicated that he was unable to recall the initial response.

6. **Misremembering (W)**

This indicator was scored when the subject gave a different response on retest.

Forgetting and misremembering, of course, are mutually incompatible and cannot co-occur.

7. **Response Repetition (RR)**

Response repetition was scored when a subject responded with a word already used as a response to a previous stimulus. However, when different stimulus words which are closely associated with one another appear in the same list, true associations may also occur which fulfill the above definition of response repetition. For example, a common response to stimulus words 'man' and 'beautiful' is 'woman'. Because the stimulus word 'beautiful' occurs after stimulus word 'man' in the word list, the response of 'woman' to 'beautiful' inflates the response repetition score due to the composition and arrangement of the list. Following Brown (1965) and Kuntz (1974), no response given to a particular stimulus word by more than five percent of the subjects was regarded as an instance of response repetition.

Furthermore, the identified word association emotional indicators located in the word association test responses were also used to identify the joint occurrence of two and/or three emotional indicators at same place and for the same stimulus word (e. g., RSBR–LRT and UR–LRT– RR). A frequency occurring in any of the three categories of emotional indicators (single, combination of two or three) was given a score of 1.

Computation of Response Entropy of Stimulus Word of Kent-Rosanoff Word Association Test

In order to facilitate the computation of response entropy, the responses of 250 subjects to 100 stimulus words were tabulated, showing the number of different responses (D) to each stimulus word and the code number for the emotional indicators with respect to each response was entered in the appropriate cell. The response entropy (RE) for each stimulus word was calculated using Laffal 's formula: $\mathbf{RE} = -\sum p_i \mathbf{log}^2 p_i$ (Laffal1955), where p_i is the probability of occurrence for a given response. Detailed procedure is elaborated in the following example:

Let us examine the responses given by 250 subjects to the stimulus word 'black'. The total number of 45 different responses of the subjects, varying for each response, and the

frequencies of their occurrence are reported in Table 1. It reveals that each response has a different probability of occurrence. The probability of occurrence of a response (p_i) was computed for each response separately by the formula: $p_i = f / N$, where 'f" denotes frequency of occurrence of a response word and N is the number of subjects in the sample. For the response word 'white' $p_i = 52 / 250$ i.e., 0.208. The p_i values computed for all the responses to the stimulus word 'black' are reported in column 3, Table 1.

Further following Newman's Table (Newman, 1951) the p_i values for the various responses to the stimulus word were used to compute - $p_i \log^2 p_i$ for each response word separately. The value of - $p_i \log^2 p_i$ computed for each response word are reported in column 4, Table 1. The sum of - $p_i \log^2 p_i$ for all the responses elicited by the stimulus word 'black' is 3. 8445, the value of response entropy for this stimulus word. The response entropy values for all the 100-stimulus word of Kent-Rosanoff word association test were calculated accordingly.

Table 1**. Frequency (f), Probability of Occurrence (p_i) and response Entropy Value* **(- pi $\log^2$pi)** ***of Each Response to Stimulus Word 'BLACK' **(N= 250)**

Response Word	**f**	**P_i**	**- $p_i \log^2 p_i$ ***
White	52	0.0208	0.4712
Dark	46	0.184	0.4494
Color	38	0.152	0.4131
Board	24	0.096	0.3246
Night	20	0.080	0.2915
Hair	7	0.028	0.1444
Shoe	6	0.024	0.1291
Shirt	6	0.024	0.1291
Red	4	0.016	0.0955
Paper	4	0.016	0.0955
Light	3	0.012	0.0766
Cloth	3	0.012	0.0766
Blackness	2	0.008	0.0557
Cloud	2	0.008	0.0557
Pen	2	0.008	0.0557
Chair	2	0.008	0.057
Pain, elephant, face, coat, buffalo, crow, cow, darkness, cap, man, body, almirah, blackly, money, house, cobra, umbrella, tree, unlike, precipitate, bull, sofa, universe, unseen, radiation, cottage, spot, enlightenment, and green	1 (each)	0.004 (each)	0.0319 (each)

Total Number of different responses (D): 45 and RE= - $\Sigma\, p_i \log^2 p_i$ = 3.8445

**The Negative sign in the formula merely provides for a positive value of RE.*

Computation of the Potential of 'Each Stimulus Word' to Elicit Various Word Association Emotional Indicators

Following the procedure as discussed before, the word association emotional indicators were identified from the responses of 250 subjects to the 100 stimulus words of the Kent-Rosanoff word association test. The identified emotional indicators were used to determine the potential of each stimulus word to elicit various types of emotional indicators. This was done by counting the frequency of seven categories of emotional indicators in the total responses of 250 subjects to each stimulus word. Thus, for each stimulus word, eight types of scores were available to study the relationship of response entropy with word association emotional indicators elicited by 100 stimulus words of Kent-Rosanoff word association test; (1) scores from seven categories of word association emotional indicators elicited by the respective stimulus word, and (2) response entropy value of the stimulus word. From this information, the relationship of response entropy with word association emotional indicators was studied.

Selection of Homogenous Stimulus Words of Kent-Rosanoff Word Association Test and Computation of Score on Various Word Association Emotional Indicators For "Each Subject"

In this case, the scores for various emotional indicators were obtained for each subject. This computation differs from the one discussed in the previous paragraph in the sense that in this computation, the scores for different emotional indicators are obtained for each subject, whereas the computational procedure described earlier refers to scores for different emotional indicators for each stimulus word.

Following the procedure as discussed earlier, the word association emotional indicators were identified from the responses of 250 subjects to the 68 stimulus words of average response entropy value. The selection of homogenous stimulus words was made in the light of the principle of normal distribution, out of 100 stimulus words included in Kent–Rosanoff word association test, 68 stimulus word of average response entropy value were selected (Appendix 1). 16 high and 16 low response entropy value stimulus words were eliminated to select only those stimulus words which have average response entropy value (Appendix II and III). This was done in view of the findings revealing a significant relationship between response entropy value of stimulus word and word association emotional indicators. These findings suggest that response entropy of the stimulus word is an important interfering variable and the genuineness of word association emotional indicators as indices of emotionality cannot be understood properly without due regard to response entropy.

Seven identified word association emotional indicators: repetition of stimulus before responding (RSBR), Unique response (UR), long reaction time (LRT), response repetition (RR), moderately infrequent responses (UR'), misremembering (W) and forgetting (Fg.); six joint occurrences of two emotional indicators occurring at the same place and for the same stimulus word (RSBR-LKT; LRT-W; LRT-RR; UR-W; UR-RR and RR-W) and two combinations of simultaneous occurrence of three emotional indicators at the same place for the same stimulus word: (UR-LRT-RR and UR-LRT-W) derived from 68 stimulus

words of average response entropy value were used to obtain the score for each subject. A frequency concurring in any of these fifteen types of emotional indicators was given a score of 1. The combinations of emotional indicators occurred too infrequently to permit statistical analysis were ignored in the analysis.

Analysis

First, the relationship of response entropy with emotional indicators was studied by computing correlations. For this purpose, the following measures were used: (a) response entropy value of each stimulus word; and (b) scores for each stimulus word on seven categorized emotional indicators. Secondly, word association test consisting of 68 stimulus words of average response entropy value was validated on psychiatrically diagnosed patients. For this, an average score on fifteen categorized emotional indicators (including two/three emotional indicators occurring together at the same place for the same stimulus word) of paranoid schizophrenics, non-paranoid schizophrenics, non-psychotic psychiatric patients and normals was used.

RESULTS

Reliability Coefficients of Kent-Rosanoff Word Association Test

The test-retest reliability coefficients for word association test measures were calculated. The time gap between the two testing was one month. The reliability coefficients are shown in Table 2. The test-retest reliability coefficients for forgetting and misremembering were not obtained since the subjects in the first testing situation had been tested with specific instructions to reproduce their earlier responses.

The reliability coefficient ranged between .601 and .767. These coefficients compare favorably with those reported for projective tests. Hundal & Upmanyu (1981) and Upmanyu, Bhardwaj & Singh (1996) found the reliability coefficients of word association emotional indicators derived from Kent-Rosanoff word association test ranged from .42 to .76 and .57 to .80 respectively. All the same, the fact that all of the 100 stimulus words in the word association test elicited emotional indicators, may be interpreted as some type of internal consistency among the stimulus words. The magnitude of consistency, however, could not be quantified.

Table 2. Reliability Coefficient of Word Association Emotional Indicators

S. No.	Word Association Emotional Indicators	Reliability Coefficients*
1.	RSBR: Repetition of stimulus before responding	.601
2	UR: Unique response	.767
3.	LRT: Long reaction time	.683
4.	RR: Response repetition	.713
5.	UR/: Moderately infrequent response	.722
6.	W: Misremembering	-
7.	Fg.: Forgetting	-

* N=50.

Relationship Between Response Entropy and Word Association Emotional Indicators

As described earlier, for each 'Stimulus Word' of the Kent-Rosanoff word of association test, eight types of scores were available. Out of these eight types of scores, one score pertains to response entropy (RE) of the stimulus word, whereas the remaining seven types of scores refer to the scores on different categories of word association emotional indicators elicited separately by each stimulus word. From this information, the relationship of response entropy with emotional indicators was studied by computing product-moment correlations. This was done after ascertaining that data fulfill the main requirements underlying the use of product-moment correlation. The correlations are shown in Table 3.

A perusal of Table 3 reveals that response entropy is positively and significantly correlated with all the emotional indicators expect response repetition. Another interesting feature of the referred inter-correlation matrix refers to significant correlations among various emotional indicators. It implies considerable overlap among the various emotional indicators, a situation that tends to mask the genuine correlations of response entropy with different emotional indicators. It was, therefore, thought advisable to partial out the effect of major interfering variables from the correlations between response entropy and emotional indicators. The correlations obtained after removing the influence of overlapping variables are given in Table 4.

Table 3. Inter-correlations Between Response Entropy and Word Association Emotional Indicators Elicited Separately by100 Stimulus Word of Kent-Rosanoff Word Association Test

	1 RE	**2 RSBR**	**3 UR**	**4 LRT**	**5 RR**	**6 W**	**7 Fg.**	**8 UR/**
1.RE	-	.52	.78	.62	.10	.42	.61	.49
2.RSBR		-	.34	.64	.08	- .11	.41	.29
3.UR			-	.52	.14	.02	.59	.36
4.LRT				-	.27	- .27	.46	.30
5.RR					-	.10	.01	.10
6.W						-	.08	.10
7.Fg.							-	.20
8.UR/								-

Value of r significant at .01 level = .254

Table 4. Coefficients of Partial Correlations Among Different Variables

(I)	r13.4	= 0.70	(XVI)	r 12.34	= 0.27
(II)	r13.2	= 0.75	(XVII)	r 12.37	= 0.39
(III)	r13.7	= 0.66	(XVIII)	r 17.3	= 0.35

(IV)	r13.24	= 0.69	(XIX)	r17.4	= 0.46
(V)	r13.47	= 0.63	(XX)	r 17.2	= 0.52
(VI)	r13.27	= 0.67	(XXI)	r17.34	= 0.29
(VII)	r14.2	= 0.45	(XXII)	r17.32	= 0.27
(VIII)	r14.3	= 0.40	(XXXII)	r 17.24	= 0.46
(IX)	r14.7	= 0.49	(XXIV)	r 18.2	= 0.41
(X)	r14.23	= 0.22	(XXV)	r18.3	= 0.36
(XI)	r14.37	= 0.35	(XXVI)	r18.4	= 0.41
(XII)	r14.27	= 0.37	(XXVII)	r 18.23	= 0.30
(XIII)	r12.3	= 0.43	(XXVIII)	r18.24	= 0.39
(XIV)	r12.4	= 0.20	(XXIX)	r 18.34	= 0.34
(XV)	r12.7	= 0.38			

Note: Different Variables: 1. Response entropy; 2. Repetition of stimulus before responding; 3.Unique response; 4. Long reaction time; 5. Response repetition; 6. Misremembering; 7. Forgetting; 8. Moderately infrequent response.

Word Association Test Performance on Psychiatrically Diagnosed Patient

Kent-Rosanoff word association test consisting of 68 homogeneous stimulus words of average response entropy was administered and scored as discussed earlier. The patterns of word association emotional indicators were studied on four different groups comprising of: paranoid schizophrenics, non-paranoid schizophrenics, non-psychotic psychiatric patients and normals. The mean scores pertaining to different emotional indicators on the four groups are reported in Table 5. The mean scores were not compared statistically by applying t-test of significance, since the number of subjects in the normal group differed markedly from the number of subjects in other three groups. The comparison of the mean scores of different groups, however, revealed some trend which should be treated as a humble beginning in this particular direction.

DISCUSSION

The main purpose of this investigation was to ascertain the relationship of response entropy with word association emotional indicators elicited from Kent-Rosanoff word association test. An examination of Table 3 reveals that correlations of response entropy with unique (UR) and moderately infrequent word associations ($UR^{/}$) are significant. Furthermore, it can be noted from Table 4 that the correlation of response entropy with unique responses remains statistically significant at .01 level of significance even after the effect of long reaction time (LRT), repetition of the stimulus before responding (RSBR) and forgetting (Fg.) is partial out separately or in combinations thereof. It implies that there is a genuine positive correlation between response entropy and unique response. The same trend holds good for the moderately infrequent word associations.

It can also be noted that the correlation between response entropy and long reaction time is reduced considerably when the effect of unique response, repetition of the stimulus before responding and forgetting is partial out separately or in combination thereof. The lowest correlation between response entropy and long reaction time after partial-ling out the influence of overlapping variable is .22 ($p < .05$). It seems that there is also a genuine, though moderate positive correlation between response entropy and long reaction time. This information fully accords with Laffal 's (1955) claims, who maintains that the positive relationship between response entropy and long reaction time is mainly due to the fact that high response entropy of stimulus words tends to increase the interference among available responses to the stimulus words. Wiggins (1957), too, concluded: "associative latency increases as the number of response alternatives increases". More recently, Upmanyu (1981) found that long reaction time is positively and significantly related to response entropy. The utility of long reaction time as an emotional indicator should be viewed in the light of its relationship with response entropy. However, Mandler and Mandler (1962) failed to confirm Laffal's findings and arrived at a different conclusion when they found that stimuli which tend to evoke many associations tend to elicit a short reaction time. It possibly suggests that a relationship between response entropy and long reaction time is far more complex than the explanation offered by Laffal. A similar argument can be extended to show that the relationship between response entropy and repetition of the stimulus before responding is also moderate and genuine, significant at .01 level. This finding fails to confirm Upmanyu's (1981) claim that response entropy and repetition of the stimulus before responding are more or less unrelated variables.

It can be noted that response entropy is positively and significantly correlated with misremembering and forgetting. The correlation between response entropy and forgetting is reduced considerably when the effect of long reaction time, repetition of the stimulus before responding and unique response is partial out. However, the correlation after partial-ling out the influence of overlapping variables remains statistically significant at .01 level of significance. This information lends support to Laffal 's (1955) findings which revealed that reproduction failure is most likely to occur, when there are many available responses to a stimulus word (stimulus words of high response entropy value), and less likely to occur where strongly dominant responses are available for the stimulus word (stimulus word of low response entropy value). However, the obtained correlations of response entropy with forgetting and misremembering contradicts Upmanyu's (1981) findings which revealed insignificant correlations of response entropy with misremembering and forgetting. The correlations, however, were positive.

Another correlation which draws attention is between misremembering and forgetting, the correlation being insignificant. Misremembering and forgetting, thus, do not appear to be functionally equivalent. The inference supports Brown 's (1965) claim regarding the nature of forgetting and misremembering as indices of reproduction failure. Thus, the separate treatment of these two emotional indices in contrast to Laffal (1955) who combined these two indices into one for scoring reproduction failure, is fully supported by the fact that the

correlation between forgetting and misremembering is low and non-significant. Furthermore, an examination of inter-correlation matrix reveals insignificant correlation (r = .10) between response entropy and response repetition.

Another objective of this investigation was to validate the diagnostic utility of Kent-Rosanoff word association test on psychiatrically diagnosed patients. A perusal of Table 5 reveals that with respect to emotional indicators long reaction time and repetition of stimulus before responding, the mean scores of paranoid schizophrenics are significantly higher in comparison to the other three groups comprising of non-paranoid schizophrenics, non-psychotic psychiatric patients and normals. The mean scores of non-paranoid schizophrenics and non-psychotic psychiatric patients are more or less similar to the normals. It can be noted that mean scores of normals, non-psychotic psychiatric patients, non-paranoid schizophrenics and paranoid schizophrenics pertaining to joint occurrence of LRT-RSBR are 14.91, 15.93, 16.43 and 27.20, respectively.

A comparison of the mean scores of long reaction time and reputation of stimulus before responding when treated 'singly' and 'jointly' reveals that the joint occurrence of LRT-RSBR has more diagnostic potency in the sense that paranoid schizophrenics have been differentiated more markedly from the other three groups. This inference is substantiated from an examination of difference in the mean scores of different groups on the involved emotional indicators when treated singly or jointly. All this suggests that the earlier findings of Upmanyu and Singh (1995), Upmanyu, Bhardwaj & Singh (1996) and Upmanyu et el. (2010) pertaining to the joint occurrence of LRT-RSBR as an index of paranoid type insecurity has got confirmation in the sense that on the joint occurrence of long reaction time and reputation of stimulus before responding, the paranoid schizophrenics scored significantly more in comparison to normals, non-paranoid schizophrenics and non-psychotic psychiatric patients.

Furthermore, it can also be noted that mean scores of both non-paranoid and paranoid schizophrenics on unique response (UR), response repetition (RR) and misremembering (W) are more in comparison to non-psychotic psychiatric patients and normals. On these emotional indicators, the mean scores of non-paranoid and paranoid schizophrenics are more or less similar. A perusal of Table 5 also reveals that with respect to the joint occurrence of UR-RR and UR-W, the mean scores of paranoid and non-paranoid schizophrenics are markedly more in comparison to normals and non-psychotic psychiatric patients. Furthermore, it can be noted that the mean scores pertaining to joint occurrence of RR-W reveal the same trend which has been found for RR and W when treated singly.

Table 5.Mean Scores Concerning Word Association Emotional Indicators Given by Normals, Non-Psychotic Psychiatric Patients, Non- Paranoid Schizophrenics and Paranoid Schizophrenics.

	Emotional Indicators**														
Groups	RSBR	UR	LRT	RR	W	Fg	UR /	RSBR-LRT	LRT-W	LRT-RR	UR-W	UR-RR	RR-W	UR-LRT-RR	UR-LRT-W
Normals[1]															
Mean	18.39	16.28	43.59	8.15	8.03	4.72	28.35	14.91	5.28	5.28	2.66	2.51	1.35	1.70	2.10
SD	15.10	7.15	14.19	4.62	5.26	4.12	4.50	11.99	4.23	3.60	2.42	2.72	6.49	1.74	2.07
Non-psychotic Psychiatric Patients[2]															
Mean	18.66	15.16	44.69	8.09	9.81	3.62	26.60	15.93	6.07	5.24	4.80	3.53	2.00	2.33	2.46
SD	16.42	8.36	14.30	9.28	6.58	2.58	4.24	12.49	5.39	5.26	3.48	4.28	2.00	2.52	2.92
Non-paranoid Schizophrenics[3]															
Mean	19.70	21.10	43.13	16.93	15.47	5.20	28.20	16.43	8.07	8.53	12.87	12.47	6.20	7.86	7.01
SD	14.21	7.19	12.04	3.57	5.63	4.04	4.29	12.16	5.15	4.55	4.14	3.35	1.20	2.27	3.23
Paranoid Schizophrenics[4]															
Mean	28.10	20.10	49.80	15.01	13.86	5.72	29.07	27.20	10.97	10.47	10.33	11.27	5.67	8.72	8.01
SD	16.39	8.54	12.31	4.58	7.31	7.71	3.45	9.45	5.84	3.69	4.59	3.94	1.35	2.09	3.61
$\lvert *D_{1-2} \rvert$	0.27	1.12	1.10	0.06	1.78	1.10	1.75	1.02	0.49	0.04	2.14	1.02	0.65	0.63	0.36
$\lvert D_{1-3} \rvert$	1.31	4.82	0.46	8.78	7.44	0.48	0.15	1.52	2.49	3.25	10.21	9.96	4.85	6.16	4.91
$\lvert D_{1-4} \rvert$	9.71	3.82	6.21	6.86	5.83	1.00	0.72	12.29	5.39	5.19	7.67	8.76	4.32	7.02	5.91
$\lvert D_{2-3} \rvert$	1.04	5.94	1.56	8.84	5.66	1.58	1.60	0.50	2.00	3.29	8.07	8.94	4.20	5.53	4.55
$\lvert D_{2-4} \rvert$	9.44	4.94	5.11	6.92	3.85	2.10	2.47	11.27	4.90	5.23	5.53	7.74	3.67	6.39	5.55
$\lvert D_{3-4} \rvert$	8.40	1.00	6.67	1.92	1.61	0.52	0.87	10.77	2.90	1.94	2.54	1.20	0.53	0.86	1.00

**D stands for difference between mean scores*

***Decoding of abbreviations for Emotional Indicators is given in Scoring of K-R WAT*

A comparison of the mean scores of unique response, response repetition and misremembering when treated 'singly' and 'jointly' reveals that the joint occurrence of UR-RR and UR-W has more diagnostic potency in the sense that paranoid and non-paranoid schizophrenics have been differentiated more markedly from the other two groups comprising of normals and non-psychotic psychiatric patients. These three emotional indicators when treated singly or jointly, however, could not differentiate between paranoid and non-paranoid schizophrenics. These results lend credence to the earlier findings of Upmanyu & Singh (1995), and Upmanyu et el. (2010) that joint occurrence of UR-RR and UR-W provides more significant information about psychosis proneness than the separate use

of these emotional indicators. It can also be noted from these studies that findings concerning the utility of the joint occurrence of LRT-W and LRT-RR for identifying psychosis proneness could not be validated to the desired level on psychiatric patients, although the trend is in the expected direction of high mean scores for paranoid and non-paranoid schizophrenics.

An examination of table 5 reveals that the mean scores of paranoid and non-paranoid schizophrenics on the joint occurrence of UR-LRT-RR and UR-LRT-W are markedly higher in comparison to normals and non-psychotic psychiatric patients. A comparison of the mean scores of simultaneous occurrences of the above referred three emotional indicators with the mean scores of these emotional indicators when treated singly and jointly reveals that simultaneous occurrence of these three emotional indicators has more diagnostic potency in the sense that paranoid and non-paranoid schizophrenics have been differentiated more markedly from the other two groups comprising of normals and non-psychotic psychiatric patients. The simultaneous occurrence of these three emotional indicators (UR-LRT-RR; UR-LRT-W), however, could not differentiate between paranoid and non-paranoid schizophrenics. All this suggests that earlier findings of Upmanyu & Singh (1995), and Upmanyu et el. (2010) pertaining to the joint occurrence of UR-LRT-RR and UR-LRT-W as an index of psychosis proneness has gotten confirmation in the sense that paranoid and non-paranoid schizophrenics scored significantly more in comparison to normals and non-psychotic psychiatric patients. Thus, there is a strong justification for clinicians to use the joint occurrence of these emotional indicators for tapping a common factor associated with the willingness to be unconventional. More specifically, the findings also provide evidence to Upmanyu and Singh (1995)'s investigation that the joint occurrence of these emotional indicators could be used for identifying individuals who are “at risk” with respect to a variety of adjustment problems later in life.

Keeping in view what has been said in the preceding paragraphs, it can be concluded that response entropy is positively and significantly related to unique response, moderately infrequent response, long reaction time, repetition of stimulus before responding, misremembering and forgetting, while its correlation with response repetition though positive is statistically insignificant. The inference suggests that the genuineness of these emotional indicators as indices of pathological characteristics cannot be understood adequately without due regard to their relationship with response entropy. The 'diagnostic potential' of the list of 68 homogenous stimulus words of average response entropy derived from K-R WAT is encouraging. The findings have been confirmed to a great extent on psychiatrically diagnosed population.

Acknowledgments
The investigator is thankful to Professor V. V. Upmanyu Department of Psychology Panjab University Chandigarh (India) for valuable help and critical suggestions.

Conflict of Interest: The author declared no conflict of interests.

REFERENCES

Andress, V. R., Frazini, L. R., and Linton, M. A. (1974). Comparison of homosexual and heterosexual responses to the Menninger word association test. *Journal of Clinical Psychology*, 30, 205-207.

Appelbaum, S. A. (1960). Automatic and selective processes in the word associations of brain-damaged and normal subjects. *Journal of Personality*, 28, 64-72.

Brown, W. P. (1965). Emotional indicators in word association. *British Journal of Psychology*, 56, 401-412.

Brown, W. P. (1970). Individual differences in associating to neutral and emotional words. *Journal of Consulting and Clinical Psychology*, 34, 33-36.

DeWolfe, A. S., and Youkilis, H. D. (1974). Stress and the word associations process and reactive schizophrenics. *Journal of Clinical Psychology*, 30, 151-153.

Dooley, L. (1916). A study in correlation of normal complex by means of the association method. *American Journal of Psychology*, 27, 132.

Fuller, G. D., and Kates, S. L. (1969). Word association repertories of schizophrenics and normals. *Journal of Consulting and Clinical Psychology*, 33, 497-500.

Galton, F. Cf. H. H. Anderson and G. L. (1951). *An introduction to projective techniques*. Englewood Cliffs, N. J.:Prentice-Hall, Inc.

Goldstein, M. J. (1961). The relationship between anxiety and oral word association performance. *Journal of Abnormal and Social Psychology*, 62, 468-471.

Gough, H. C. (1976). Studying creativity by means of word association tests. *Journal of Applied Psychology*, 61,348-353.

Hull, C. L., and Lugoff, L. S. (1921). Complex signs in diagnostic free association. *Journal of Experimental Psychology*, 4, 111-136.

Hundal, P. S., and Upmanyu, V. V. (1974). Emotional indicators in word association and their relation with psychometric measures of anxiety and neuroticism. *International Review of Applied Psychology*, 23, 111-120.

Hundal, P. S., and Upmanyu, V. V. (1981). Nature of emotional indicators in Kent-Rosanoff word association test: An empirical elaboration. *Personality Study and Group Behavior*, 1, 50-61.

Kent, G. H., and Rosanoff, A. (1910). A study of association in insanity. *American Journal of Insanity*,67, 37-96; 317-390.

Kuntz, D. (1974). Response faults on word association as a function of associative difficulty and affective connotation of the words. *Journal of Consulting and Clinical Psychology*, 42, 231-235.

Laffal, J. (1955). Response faults in word association as a function of response entropy. *Journal of Abnormal and Social Psychology*, 50, 265-270.

Lisman, S. A., and Cohen, B. D. (1972). Self-editing deficits in schizophrenia: A word-association analogue. *Journal of Abnormal Psychology*, 79, 181-188.

Mandler, G., and Mandler, J. M. (1962). Associative behavior and somatic response. *Canadian Journal of Psychology*, 16, 331-343.

Meyers, R., and Brecher, S. (1941). The so-called epileptic personality as investigated by the Kent-Rosanoff test. *Journal of Abnormal and Social Psychology*, 36, 413-422.

Miller, E. N., and Chapman, L. J. (1983). Continued word association in hypothetically psychosis-prone college students. *Journal of Abnormal Psychology*, 94, (4), 468-478.

Newman, E. B. (1951). Computational methods in analyzing series of binary data. *American Journal of Psychology*, 64, 252-262.

Penk, W. E. (1978). Effects of ambiguous and unambiguous stimulus word differences on popular responses of schizophrenics. *Journal of Clinical Psychology*, 34, 838-843.

Penk, W. E., and Kidd, R. V. (1977). Difference in word-association commonality of schizophrenics: The self-editing-deficit model vs. the partial-collapse-of-response-hierarchy hypothesis. *Journal of Clinical Psychology*, 33, 32-39.

Rapaport, D., Gill, M., and Schafer, R. (1946). *Diagnostic psychological testing: The theory, statistical evaluation and diagnostic application of a battery of tests*. Chicago: Year Book Publishers.

Sarason, I. G. (1959). Relationship of measures of anxiety and experimental instructions to word association test performance. *Journal of Abnormal and Social Psychology*, 59, 37-42.

Sarason, I. G. (1961). A note on anxiety, instructions, and word association performance. *Journal of Abnormal and Social Psychology*, 62, 153-154.

Schwartz, S. (1978). *Language and cognition in schizophrenia: A review and synthesis. In S. Schwartz (Ed.), Language and cognition in schizophrenia*. Hillsdale, N. J.: Erlbaum. (a)

Schwartz, S. (1978). Do schizophrenics give rare word associations? *Schizophrenia Bulletin*, 4, 248-251. (b)

Shakow, D. (1980). Kent-Rosanoff association and its implications for segmental set theory. *Schizophrenia Bulletin*, 6, 676-685.

Singh, S., Panda, S. N., and Upmanyu, V. V. (1998). Forgetting of word associates in relation to recall interval. *Journal of the Indian Academy of Applied Psychology*, 24, (1-2), 79-82.

Smith, W. W. (1922). *The measurement of emotion*. London: Kegan Paul.

Storms, L. H., Broen, W. E., and Levin, I.P. (1967). Verbal associative stability and commonality as a function of stress in schizophrenics, neurotics, and normals. *Journal of Consulting Psychology*, 31, 181-187.

Tecca, J. J., and Glassco, J. A. (1965). Word association time as a function of anxiety (drive) and response competition. *Psychological Reports*, 16, 40.

Upmanyu, V. V. (1981). Study of Kent-Rosanoff word association test in relation to response entropy. *Personality Study and Group Behavior*, 1, 45-52.

Upmanyu, V. V., Bhardwaj, S., and Singh, S. (1996). Word-association emotional indicators: Associations with anxiety, psychoticism, neuroticism, extraversion, and creativity. *The Journal of Social Psychology*, 136,(4),521-529.

Upmanyu, S., Upmanyu, V. V., Lal, R., Pandeya, N. (2010). An empirical investigation of the utility of word association emotional indicators. *Indian Journal of Psychological Science*, 1, 85-103.

Upmanyu, V. V., and Singh, S. (1995). Utility of single versus joint occurrence of word-association emotional indicators. *Journal of the Indian Academy of Applied Psychology*, 21, (1), 65-70.

Upmanyu, V. V., and Upmanyu, S. (1988). Utility of word association emotional indicators for predicting pathological characteristics. *Personality Study and Group Behavior*, 8, 13-22.

Vernon, P. E. (1964). Creativity and intelligence. *Educational Research*, 6, 163-169.

Wiggins, J. S. (1957). Two determinants of associative reaction time. *Journal of Experimental Psychology*, 54,144-147.

Appendix I: ***Average Response Entropy Stimulus Words***

Sr. No.	Sr. No. In K.R.- WAT	Stimulus Words	Response Entropy
1	3	Music	4.527
2	4	Sickness	4.165
3	5	Man	4.846
4	6	Deep	5.063
5	7	Soft	5.134
6	9	Mountain	4.398
7	10	House	4.836
8	11	Black	4.845
9	12	Mutton	4.879
10	13	Comfort	4.930
11	14	Hand	4.121
12	17	Butterfly	4.443
13	19	Command	4.324
14	21	Sweet	4.935
15	23	Woman	4.521
16	25	Slow	4.435
17	27	River	3.959
18	28	White	4.726
19	29	Beautiful	4.301
20	31	Rough	4.759
21	32	Citizen	4.323
22	33	Foot	4.641
23	34	Spider	4.431
24	35	Needle	4.306

Sr. No.	Sr. No. In K.R.- WAT	Stimulus Words	Response Entropy
25	36	Red	4.212
26	38	Anger	5.115
27	40	Girl	4.718
28	41	High	4.445
29	43	Sour	4.314
30	46	Soldier	5.151
31	47	Cabbage	3.952
32	48	Hard	4.830
33	49	Eagle	3.89
34	50	Stomach	4.753
35	53	Dream	3.941
36	54	Yellow	4.307
37	55	Bread	5.165
38	56	Justice	4.456
39	57	Boy	4.856
40	58	Light	4.475
41	59	Health	4.438
42	60	Bible	4.022
43	62	Sheep	4.042
44	63	Bath	3.957
45	64	Cottage	5.098
46	67	Hungry	4.062
47	68	Priest	4.894
48	69	Ocean	4.261
49	70	Head	4.060
50	73	Religion	4.575
51	74	Whiskey	4.109
52	75	Child	4.979
53	77	Hammer	5.148
54	79	City	3.867
55	81	Butter	4.173
56	83	Loud	4.922
57	85	Lion	4.726

Sr. No.	Sr. No. In K.R.- WAT	Stimulus Words	Response Entropy
58	87	Bed	4.049
59	88	Heavy	5.095
60	89	Tobacco	3.953
61	90	Baby	4.853
62	92	Scissors	3.901
63	94	Green	4.126
64	95	Salt	4.901
65	96	Street	5.021
66	97	King	4.743
67	99	Blossom	4.750
68	100	Afraid	5.167

Appendix II: Low Response Entropy Stimulus words

Sr. No.	Sr. No. In K.R.- WAT	Stimulus Words	Response Entropy
1	1	Table	3.560
2	2	Dark	3.439
3	8	Eating	3.567
4	16	Fruit	3.577
5	20	Chair	3.480
6	24	Cold	3.550
7	30	Window	3.785
8	37	Sleep	3.819
9	39	Carpet	3.367
10	52	Lamp	3.106
11	66	Blue	3.842
12	71	Stove	3.827
13	78	Thirsty	3.114
15	82	Doctor	3.120
15	91	Moon	3.674
16	98	Cheese	3.539

Appendix III: ***High Response Entropy Stimulus Words***

Sr. No.	Sr. No. In K.R.- WAT	Stimulus Words	Response Entropy
1	15	Short	5.191
2	18	Smooth	6.034
3	22	Whistle	5.520
4	26	Wish	5.807
5	42	Working	5.263
6	44	Earth	5.242
7	45	Trouble	6.193
8	51	Stem	6.095
9	61	Memory	5.817
10	65	Swift	5.703
11	72	Long	5.251
12	76	Bitter	5.787
13	80	Square	5.641
14	84	Thief	5.600
15	86	Joy	5.254
16	93	Quite	6.096

How to cite this article: Singh S (2017). The Diagnostic Utility of Kent-Rosanoff Word Association Test In relation to Response Entropy. *International Journal of Indian Psychology*, Vol. 5, (1), DIP: 18.01.053/20170501, DOI: 10.25215/0501.053