# TASK-ORIENTATION AS IT RELATES TO PSYCHOLOGICAL EFFICIENCY

by

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B. A., University of Victoria, 1966

A THESIS SUBMITTED IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in the Department

of

Psychology

We accept this thesis as conforming

to the required standard

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Accepted for the Faculty of Graduate Studies

[redacted]

May 1968



UNIVERSITY OF VICTORIA

March 1968.

SUPERVISOR: Dr. Howard J. Simmons

## Abstract

Two experiments are reported using senior high school students as Ss. The purpose of both experiments was to discover if the findings of Wishner's (1955) series of studies, concerning his concept of psychological efficiency, could be generalized to a population other than that which Wishner had used: first year college students. In his studies Wishner defined psychological efficiency as a function of the ratio of energy expended directly on the task to energy expended in activity irrelevant to the task. Orientation or direction of centering, whether toward the task or toward the ego, was basic to Wishner's experimental studies: in the experiments reported here the direction of centering was manipulated by another strategy of instruction than that customarily used by Wishner (1962). Results of the experiments gave only qualified support to the results which Wishner had demonstrated repeatedly and, in some respects, revealed a pattern of energy expenditure diametrically opposed to Wishner's findings.

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## Acknowledgements

Acknowledgement is gratefully extended to Dr. H. J. Simmons for his help on this project, also to Mrs. Ann Gosse for her efforts in transporting subjects.

## Experiment I

The experiment reported has its theoretical basis in Wishner's (1955), conceptualization and definition of psychological efficiency, which was based on his adaptation of the physical science's formula for mechanical efficiency. Also of theoretical interest was the suggestion (Wishner, 1955) that an objective measure of psychological efficiency might constitute a dimension of the intensity, or extent, of psychopathology. If such an objective measure of psychological efficiency could be generally applied and if it could be shown that it did indeed provide an indication of the extent of psychopathology, this would provide a very useful tool for clinical diagnosis.

This concept of efficiency grew out of ideas expressed by Wertheimer (1959), concerning the effects of egocentricity i.e. egocentering. Wertheimer was one of the first to observe the influence on efficient behaviour of ego-centering as compared to task-centering. He believed centering, in whatever direction, to be a very powerful factor in thinking and behaviour, and that centering was a factor which had been neglected by both traditional logic and psychology, even though extreme ego or self-centering is a widely accepted symptom of psychopathology. Wertheimer also stressed the importance of changing a competitive relationship, which he saw as ego or self-centered, into a cooperative one as a means of increasing task centering and therefore efficient behaviour.

Wishner suggested that efficiency be defined as "some function of the ratio of focused to diffuse behaviour (E = F/D," (1955, p, 70), but pointed out that the terms focused and diffuse are necessarily relative to task requirements and that efficiency must not be considered to be a permanent trait equally operative in all situations.

His formulation has as its principal point of departure those definitions of psychological health emphasizing appropriateness and adequacy of behaviour, but he preferred the term efficiency because he believed it was a term with greater freedom from value judgments. He pointed out that productivity per se is not a useful measure of efficiency, since it fails to take into consideration the amount of energy expended. Wishner differentiated two components of energy expended: focused energy (F), energy expended directly on the task, and diffuse energy (D), energy expended in directions irrelevant to the task. The amount of such energy expenditure has most frequently been inferred from electromyographic measure of muscle-action-potentials (MAP's), recorded by a polygraph, of both task-involved and task-uninvolved muscles.

Task orientation has been the subject of relatively few controlled experiments and there is a possibility for considerable confusion between the concepts of ego-involved and ego-centered motivation. Ego-involvment is generally defined in terms of interest in the task, and therefore ego-involved subjects cannot be regarded as ego-centered in Wertheimer's or Wishner's interpretation of the word with its connotation of centering on the ego, or the self, to the partial or complete inclusion of any interest in the task itself. In addition, the nature of the tasks used in most experiments seldom present inherently organized wholes and therefore do not lend themselves to realistic task centering.

Wishner (1962) reported the results of a series of experiments designed to measure efficiency as it relates to learning and motivation.

His experiments were designed to study the concept of ego-centered vs task-centered performance and his technique for ego-centering was similar to one used by Niebuhr (1953), which Wishner (1962) reports in some detail. For purposes of self or ego-centering, subjects were told that the E was going to measure how neurotic they were. The task-centered group was told that the ultimate success of experiments extending over five years was dependent on their utmost cooperation. First year college students were used as subjects. A simple reaction time test was used to test the efficacy of both sets of instructions. Wishner found that there were no significant differences between the two groups in reaction time but highly significant differences in MAP's and efficiency. MAP's were recorded from both the arm involved in the task and the unused arm. Reaction times were consistently low and the mean potentials from the inactive arm were in the range of 6-9 microvolts for the self-centered group and approximately 2 microvolts for the task-centered Ss-2 microvolts is the noise level of the recording device used. The mean potentials from the active arm were also consistently and significantly higher for the self centered group than for the task-centered group. To explore the possibility of a relationship between anxiety and efficiency Wishner had each subject complete the Taylor Manifest Anxiety Scale (MAS) at the end of the reaction-time test.

The present experiment was modelled on Wishner's (1955) experiment, the purpose being to investigate whether Wishner's concept of efficiency could be generalized to a senior high school student population and if task orientation could be manipulated, as Wishner allegedly did, using a slightly different type of instruction. Wertheimer's observations regarding competitive relationships suggested that instructions emphasizing competition might be used for self-centering and also that instructions emphasizing

cooperation could be used to induce task-centering, just as Wishner had done.

## Method

Subjects Two groups of 13 boys from the Grade XII classes of two local high schools were used as subjects; there already was a keenly competitive feeling between the schools. To minimize communication difficulties, the boys from one school were arbitrarily assigned to either the competitive or cooperative group. While this represented a confounding variable, Ss were matched on a pre-instructional task performance basis to reduce bias.

Procedures Thirteen Ss from each school were tested, and matching was done on the basis of average reaction time scores for the first 10 pre-instructional practice trials, on the assumption that this was an adequate measure of motivation. Because the measure of basic interest was the MAP's, Ss were also matched on the basis of average MAP's for the same first pre-instructional practice trials. From 26 Ss seven pairs of Ss could be matched to each criterion. It was possible to match Ss exactly on the basis of reaction times and within .25 of a point on the basis of MAP's. All Ss were given the same instructions as to what to do in a simple reaction time test using a telegraph key and a panel of two lights, one a warning light and one a "go" light. They were to use the middle finger of their preferred hand to operate the telegraph key; they were to depress the key when the green light came on and to release it as quickly as possible when the white light appeared. Each movement was to be as specific as possible and the unused arm was to remain relaxed on the table.

Prior to the practice trials electrodes were attached to both arms so as to give bi-polar readings of the extensor digitorum communis muscle. For each group there was an initial group of 10-20 practice trials, which constituted the pre-instructional task. Group A was then given the ego-centering or competitive instructions and Group B the task-centered or cooperative instructions; there were 50 test trials for both groups. The Ss in the ego-centered group were told that their reaction time performance was being compared with that of a group from a rival high school and that a substantial prize would go to the school group with the lowest reaction time scores. The prize was offered to accentuate and increase the already existing competitive spirit between the schools. The cooperative instructions were very similar to Wishner's in that the Ss were told that the ultimate success or failure of five year's work was dependent on their performance. MAP's were recorded continuously from both arms and reaction times to both lights were taken. Intervals between the warning light and the go light were from 2-12 seconds in random order. The intertrial interval was 5 seconds. There were 10-20 practice trials and 50 test trials and at the conclusion of the reaction time test each S completed the MAS as Wishner's Ss had been required to do, so that a check on the effect of anxiety would be possible.

Data Analyses The Mann Whitney U Test (Auble, 1953) was used to analyze data, the .05 level of significance was chosen. Although the groups were matched as to educational level, reaction time and MAP's, this matching could not be considered to be complete and therefore the Mann Whitney was believed to be more appropriate than a parametric test. Comparisons were made between competitive and cooperative groups for both the first 10 and

second 10 post-instructional trials. Only the first 20 test trials were used because a consistent pattern of response was established during this period.

## Results and Discussion

The results obtained using Ss matched for reaction time during the first 10 pre-instructional trials are shown in Table 1.

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Insert Table 1 about here

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There were no significant differences in the reaction times of the groups on either set of test trials and no significant differences in their MAS scores. However, there was a significant difference between the groups in the MAP's in both the first and second 10 post-instructional trials.

In both cases the competitive group was using considerably more energy in the active arm. This greater expenditure of energy in the active arm agrees with Wishner's findings for his ego-centered groups. However, there was not the diffuse behaviour reflected in electrical activity in the inactive arm which Wishner had found: in fact, the pattern was reversed. In the competitive group of 7 Ss there was no scorable electrical activity in the unused arm, while in the cooperative or task-centered group, whose expenditure of energy in the used arm was lower, there was a scorable electrical activity in the inactive arms of 4 out of 7 Ss. The phrase "no scorable electrical activity" means that there were no deflections of the pen recording from the inactive arm, or only one or two minor deflections during the course of 10 Rs. Such deflections were not considered to be usable in arriving at an efficiency ratio. These comparisons were originally

based on Ss matched for initial reaction times, and, since they had produced results contrary to Wishner's, the question arose as to how to account for the differences. Comparisons were then made between competitive and cooperative groups using Ss matched for initial MAP's.

The results obtained using those Ss matched for MAP's during the first 10 pre-instructional trials are shown in Table 2.

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Insert Table 2 about here

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Matched on this basis there was no significant difference between the groups on the Taylor MAS scores or in MAP's. There was, however, a significant difference between the groups in reaction times for the first 10 post-instructional trials, with the competitive group having the lower mean reaction time. The competitive groups used more energy, but again there was not the diffuse electrical activity in the inactive arm which Wishner found, and indeed the pattern was again reversed. In the competitive group, matched for initial MAP's, there was scorable electrical activity in the inactive arm of one out of seven Ss. In the task-centered group, whose expenditures of energy in the active arm was lower, there was scorable electrical activity in the inactive arms of five out of seven Ss. This diffuse expenditure of energy in the task-centered group was the reverse of what had been expected, in view of Wishner's results. The data presents a picture of the ego-centered group demonstrating less diffuse energy expenditure than the task-centered group had done.

The intention of the experiment was to discover if a result similar to Wishner's could be obtained by using another strategy of instruction. Such a result was not obtained, even though the competitive instructions were designed to produce ego-centering through the intense sort of motivation which, according to Wertheimer (1959), Wishner (1962), and Henle (1963), may impede performance. The findings of this experiment were not entirely inconsistent with those of Wishner (1962). Considering the active arm, the competitive Ss expended significantly more energy, which was in line with Wishner's (1962), finding, but on the other hand, it was puzzling to have produced a pattern of diffuse energy expenditure the reverse of that which Wishner apparently had demonstrated repeatedly. A competitive versus a cooperative situation, such as Wertheimer had discussed, had been set up, which could have been expected to duplicate Wishner's results, and yet it produced essentially negative results. It was however, realized that the competitive instructions, which were believed to be ego-centering, might be criticized as being inadequate for the purpose, and therefore it was decided to run a supplemental experiment which would attempt to answer any such criticism.

## Supplemental Experiment II

The unusual nature of the initial experimental results led to reconsideration of Wishner's instructions. Although the element of threat in his ego-centering instructions had been recognized initially, this aspect of Wishner's instructions now assumed more importance, for it was clear that in addition to the direction of centering (allegedly ego-directed centering) the instructions were also motivating by fear. Given

our social values, the suggestion that an individual obviously does not meet the "well-adjusted" norm, and is indeed measurably neurotic, constitutes a very real threat to the individual's ego and could be expected to create a considerable degree of fear or anxiety. The supplemental experiment reported attempted to add the element of threat to instructions, although in a somewhat different manner. The threat of eletrical shock was the only addition to the original set of initial instructions.

## Method

A third group of eight boys served as Ss; since representation from both schools was wanted, four Ss from each of the schools made up the sample of eight in the shock-threat experiment. No matching was done since the plan was to use them as one group. The same initial instructions were used as in Experiment I, but with the threat of shock added. This addition was explained to the Ss as a means of reducing reaction times. The threat group also completed the Taylor MAS at the end of the reaction-time testing session to check the effect of the addition of threat to the instructions. As well, they were asked, individually, if they had really believed that they were going to be shocked. The question was asked because the possibility of a substantial lack of credibility was recognized. This was not believed to be a factor in experiment I because that presentation was very straight-forward and the situations were quite believable. MAP's and reaction times were recorded in the same manner as previously and were also compared in blocks of 10 trials.

## Results

The threat group of eight Ss split into two sub-groups which were significantly different at the .01 level. The two sub-groups were: (a) "believed" the threat of shock and (b) "did not believe". Those who had believed they would be shocked, interestingly enough, were all from the same school. The schools were in different socio-economic levels of the community. This development itself surely deserves further investigation. Because of this spontaneous division the threat group was treated as two groups. The results of comparing these two groups are shown in Table 3.

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Insert Table 3 about here

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There was a significant difference in reaction times that was so marked (P .01) as to suggest that the "did not believe" subjects were, in effect, testing the limits and were quite truthful when they said they did not believe they would be shocked. There was also a significant difference between MAS scores but, oddly enough, it was the "did not believe" group who had the highest anxiety scores. No significant differences were shown in MAP's of the two threat groups. As to scorable electrical activity in inactive arms, in the shock "believe" group three out of four Ss had scorable records and in the shock "not believe" group, two out of four Ss had scorable records. In spite of the extremely long reaction times of the shock "not believe" group, their energy expenditure in the active arm was greater than that of the shock "believe" Ss.

## Discussion

The results of the present study do not provide general support for Wishner's (1955) hypothesis concerning the effects of centering upon the efficiency of performance. The discrepancy between the findings of the present study and those of Wishner might easily be attributed to the obvious procedural differences between the two sets of studies; e.g. the processing of the MAP data, the age and sophistication of the Ss, or the wording of the instructions to the Ss. On the other hand, such attribution, however plausible, would be speculative, since the available data provide little basis for evaluating the effects of such procedural variations on the Ss performance.

However, consideration of the differences between Wishner's studies and the present experiments does suggest a problem of strategy in this area of research that should be noted here. The manipulation of the Ss' motivational sets has been attempted by verbal instructions. In any particular experiment, what aspect of the motivational set (e.g., its direction, quality or intensity) has been critical to the observed effects of the instructions has appeared to be a matter of the E's intuition rather than firm theory or good evidence. The problem is one involving both theory and experimental data; to some extent, data may be traded for theory, and theory for data.

At the present time, our theories are not sufficiently well developed, and our data are not so extensive as to allow an experimental verification of the nature of the motivational changes induced by the instructions to the Ss. The obvious strategy of relying upon the Ss' introspective reports is complicated by the statistical difficulties encountered in treating free verbal report, and questionaires, designed to simplify the statistics,

may appreciably contaminate the data. The strategy proposed here is more methodologically than theoretically oriented.

Admitting that any particular set of instructions or procedures may influence several aspects of the Ss motivational states, one would find it difficult to conclude, on the basis of an experiment involving only two sets of conditions, that any one motivational factor had mediated the full effect of the instructions. In order to identify the nature of the mediating process or processes, it would appear that systematic variations in the experimental procedures or instructional content would be required. For example, in the current set of experiments, a more convincing case for the importance of fear could be made if, in addition to the threat of shock group, groups receiving various intensities of electrical shock had been used and if significant covariation between the shock level and MAP had been obtained. Similarly, a stronger argument for the importance of competition could be advanced if it were demonstrated that efficiency covaried with the instructional or situational manipulation of the degree of competition. In situations where such variations could be introduced for individual Ss, some protection against individual differences in credulity (a suspected source of error in Experiment II) would be achieved.

In summary, it is argued that an adequate experimental treatment of Wishner's (1955) hypothesis would necessarily involve the systematic variation of factors presumed to be important in determining the Ss' motivational states. The results of the present experiments provide some basis for suggesting that the experimental effect obtained by Wishner (1962) depended not only upon instructionally induced changes in the

direction of the Ss' motivation, but also upon qualitative changes in the Ss' motivation to perform the task assigned.

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## Footnotes

1. Details of method and instrument settings are given in Appendix B.

Table I

Summary of Data and Statistical Tests: Experiment I

| $N_1$ 7<br>$N_2$ 7 | | Reaction Times | | Taylor MAS | MAP's active arm, arbitrary units | | MAP's inactive arm, arbitrary units | |
|---|---|---|---|---|---|---|---|---|
| Competitive (ego-centered) | | 1st 10 | 2nd 10 | | 1st 10 | 2nd 10 | 1st 10 | 2nd 10 |
| | Median | 3.90 | 3.85 | 13 | 2.14 | 1.91 | - | - |
| | Range | 3.50-4.55 | 3.60-4.40 | 5-41 | 1.36-5.68 | .79-3.27 | | |
| Cooperation (task-centered) | Median | 4.10 | 3.80 | 19 | .77 | .38 | 4 Scorable records | |
| | Range | 3.80-4.40 | 3.30-4.50 | 13-30 | .09-4.67 | .08-2.48 | | |
| Mann-Whitney one-tailed U test | Smaller U | 17.5 | 21.5 | 14.5 | 11 | 10.5 | - | - |
| p value assoc. with U | | >.10 | >.10 | > .10 | <.05 | <.05 | - | - |

Note: Ss matched on the basis of average RT during first 10 practice trials.

Table II

Summary of Data and Statistical Tests: Experiment I

| $N_1$ 7<br>$N_2$ 7 | | Reaction Times | | Taylor MAS | MAP's active arm, arbitrary units | | MAP's inactive arm, arbitrary units | |
|---|---|---|---|---|---|---|---|---|
| Competitive (ego-centered) | | 1st 10 | 2nd 10 | | 1st 10 | 2nd 10 | 1st 10 | 2nd 10 |
| | Median | 3.85 | 3.87 | 21 | 1.70 | 2.05 | 1 | 1 |
| | Range | 3.50-4.45 | 3.60-4.45 | 5-41 | .19-5.68 | .16-3.27 | Scorable record | |
| Cooperative (task-centered) | Median | 4.15 | 3.80 | 19 | .79 | .38 | 5 | 5 |
| | Range | 3.80-4.70 | 3.50-4.45 | 13-30 | .09-4.67 | .08-2.48 | Scorable record | |
| Mann-Whitney one-tailed U test | Smaller U | 12 | 17 | 19.5 | 18 | 15 | - | - |
| p value assoc. with U | | < .10 | >.10 | >.10 | >.10 | >.10 | - | - |

Note: S matched on basis of average MAP's during 1st 10 practice trials.

Table III

Summary of Data and Statistical Tests: Experiment II

| $N_1$ 4<br>$N_2$ 4 | | Reaction Times | | Taylor MAS | MAP's active arm arbitrary units | | MAP's inactive arm arbitrary units | |
|---|---|---|---|---|---|---|---|---|
| | | 1st 10 | 2nd 10 | | 1st 10 | 2nd 10 | 1st 10 | 2nd 10 |
| Threat Believe | Median | 4.05 | 3.60 | 16.5 | 1.25 | 2.06 | 3 | 3 |
| | Range | 3.65-4.20 | 3.50-3.80 | 11-25 | .61-2.78 | .44-6.35 | Scorable records | |
| Threat Not Believe | Median | 4.42 | 4.60 | 24.5 | 1.74 | 1.80 | 2 | 2 |
| | Range | 4.25-4.90 | 4.10-4.85 | 21-26 | .70-4.21 | .93-4.45 | Scorable records | |
| Mann-Whitney one-tailed U test | Smaller U | 0 | 0 | 1.5 | 6 | 7 | - | - |
| p value assoc. with U | | <.02 | <.02 | < .10 | >.10 | >.10 | - | - |

## Appendix A

### Review of the Literature

Efficiency in the physical sciences is defined by Smith and Cooper (1957) as "the ratio of the useful work output to the work input . . . the ratio of the actual mechanical advantage to the ideal mechanical advantage (p.98)." A translation of such a definition into psychological concepts or terms has recently been developed by Wishner (1955) in an attempt to show that "the continuum of psychological health and psychopathology can be conceptualized in terms of the degree of efficiency in meeting environmental requirements (p.69). "His aim was to discover an objectively measurable dimension of psychopathology which "would be independent of type of psychopathology, in terms of symptom syndromes or of any personality typology (Wishner, 1962, p. 171)." The need for such an objectively measurably dimension, rather than clinical judgment alone, has been stressed by Meehl (1954), Sarbin et. al. (1960), Mehlman (1952) and many other writers.

Definitions of psychological health which emphasize both the appropriateness and the adequacy of behaviour were the principal point of departure for the formulation Wishner proposed. However, the term efficiency was preferred by Wishner because it seemed to him to be more free from a priori value judgments and to imply a quantifiable dimension rather than a qualitative one. He recognized that efficiency is a meaningful parameter only when the task requirements can be clearly specified and that unless its applicability to learning and motivation are shown it will remain only another descriptive method of measurement. The problems for controlled laboratory experiment in this area then become those of specifying task requirements and dis-

covering or devising a method of measuring efficiency. Wishner points out that productivity per se is not a useful measure of efficiency since it fails to take into account the amount of effort expended. This same author (Wishner, 1953) had previously observed that there are two easily discernible components of energy expenditure: (a) focused behaviour (F) energy expended directly on the task, and (b) diffuse behaviour (D), energy expended in directions irrelevant to the task. Measurements of such energy have most frequently been taken by polygraphic measurement of muscle potentials (MAP's) of both task-involved and task-uninvolved muscles. Wishner went on to suggest that efficiency might be defined as some function of the ratio of focused to diffuse behaviour (E-F/D) but pointed out that the terms "focused" and diffuse" are necessarily relative to task requirements and that efficiency must not be considered to be a permanent trait, operative for all sets of task requirements. He emphasized that "focused" or "diffused" behaviour depends on what the task requirements are perceived to be (Wishner, 1962).

A more general survey of the literature revealed numerous studies examining one aspect or another of the problem. Wertheimer (1959) was one of the first to observe the results on effective (i. e. efficient) behaviour of ego-centering as compared to task-centering - what Wishner now calls "other-centered". Wertheimer believed centering, "the way one views the parts, the items in a situation, their meaning and role as determined in regard to a center, core or radix (p. 181)" to be a very powerful factor in thinking and behaviour. Wertheimer (1959) also observed that the whole question of centering and the advantages, or disadvantages, which it created

for effective, or efficient, performance have been not only neglected, but virtually ignored, by traditional logic as well as by psychology. At the same time psychologists seem to have tacitly recognized the importance of adequate centering for extreme self-centering is a widely accepted symptom of psychopathology. Asch (1952) agreed on the importance of "centering" and proposed that the most salient problem in this regard was whether the ego could accept a secondary role or whether it did indeed remain the center of reference. Henle (1955) makes a similar point when she suggests that needs or attitudes may be highly selective influences on cognition having concomitant effects on the quality of behaviour in terms of efficiency.

Luria (1932) showed that under stress both normal and abnormal individuals tend to become diffuse in their reactions; attention span and ability to focus attention and actions on the task at hand are appreciably reduced. He also demonstrated that the amount of stress necessary to produce such diffuse reaction was a function of the degree of abnormality. Arnold (1942) showed that individuals react with different degrees of tension and that the more tense an individual is, the sooner he will break down, i.e. be reduced to only diffuse behaviour, under increased stress. That these behavioral patterns fit readily into Wishner's formula is obvious, the centering providing the focused aspect of behaviour and unfocused or disorganized aspects of behaviour providing the diffuse element.

Courts (1942) examined the effects of practice in the dynamogenic effect of induced muscle tension and found the following: (a) learning was facilitated by an optimal degree of tension up to a maximum point after which it decreased with additional practice; (b) the detrimental effect of high degrees of tension becomes more marked with practice; (c) impairment

due to greater than optimum tension occurs earlier with each successive trial and (d) optimum tension was relative to the Ss strength. Telford and Swenson (1942) showed that an initially high, generalized, diffuse muscle tension shown in a group of children in a new learning situation was substantially localized in the muscle groups specifically involved in the performance of the task as the task requirements became clear. These studies, and others having the same design, are open to the criticism that the required activity is not an integrated part of the whole task. That their findings nonetheless reflect a psychic conflict through a diffuse activity is therefore doubly interesting. Shaw (1956), did two studies on the facilitating effects of induced tension upon the perception span for digits, which, while subject to the same criticism as the above mentioned studies, found that optimal tension varied as a function of task difficulty and that induced tension facilitated both good and poor performances.

Wallerstein (1954), in an electromyographic study of attentive listening, found rising gradients of tension from forehead and chin muscles throughout the course of listening, although the forearm extensor muscles showed no clear variations. Duffy (1957), demonstrated a patterning among individuals i.e. a general rank order, with respect to muscle tension, was established when Ss were observed in various stimulus situations. Although the Ss absolute levels of tension varied, their rank order was maintained and this suggested to Duffy that an individual might be characterized as being, in general, tense or, in general, relaxed. Duffy (1957), suggests that measurement of intensity of reaction, i.e. arousal, must be along a continuum having its low point during sleep and its high point during extreme excitation or effort. Broen and Storms (1964), investigated the differential effect of

induced muscular tonus, or drive, on discrimination in schizophrenics and normals, and found that the groups did not differ on performance of tasks at low drive but that the difference between groups was statistically significant at the .01 level under high drive conditions. This study, in utilizing induced muscular tension, used a method common to many studies, but to equate muscular tension to drive because of the evidence of such studies as those of Shaw (1956), Wallerstein (1954), Courts (1942), Telford and Swenson (1942), all of which suggest a positive relationship between quality of performance and degree of muscular tension, would seem to be making a questionable assumption. As Cofer and Appley (1964) point out, drive, as viewed by Hebb and Malmo, is identical to arousal; however, the manner in which different drives contribute to arousal is still an open question, as is the problem of the control exerted on behaviour due to the qualities of the drive. Cofer and Appley (1964) see drive and arousal as being sufficiently different that they reject the concept of drive and replace it with the concept of arousal - anchored to physiological and environmental stimuli through sensitization and anticipation.

EMG studies involving mirror tracing tasks have shown some interesting reactions. Smith (1953), in a study of interrupted and completed tasks, showed that muscular tension fell more after completed tasks than after interrupted ones. EMG's were taken from five muscle groups: chin, neck, forehead, passive and active arm; it was found that activity produced a steady rise in tension which was related to distance from the goal. Smith, however, failed to relate the tension to quality of performance and made no mention of differences in EMG readings on the active and passive arms. He observed that, even after interruption of the task, muscle tension in certain

critical areas persisted for a while. Smith didn't mention which areas maintained muscle tension, but his tables suggested that the area alluded to was the active arm, Bartoshuk (1955, a), in a similar study, got comparable results but also noted that drawing speed did not increase with EMG activity. He found that the average extensor gradients, recorded during all tasks, correlated with the relative maintenance of EMG potential after interrupted tasks. He interpreted his results to suggest that EMG gradients may reflect the strength of the Ss motivation to do the required task. In a later study Bartoshuk (1955, b) found the gradient slope, especially for the right forearm extensor, to be directly related to speed and accuracy of performance and noted that within the limits of his experiment it had been demonstrated that, beyond a critical value, performance did not benefit from further increases in gradient slope. In fact there is a suggestion that, for best performance, there is an optimal value of gradient slope, and that, for slopes in excess of the optimum performance may be slightly impaired, Bartoshuk suggested that further study might yield data regarding the theoretical formulation that excessive motivation impairs performance. Henle (1963) also observed that very intense motivation may impede problem solving and notes that a certain detachment is necessary for optimal performance. This agrees with Wertheimer's (1959) ideas concerning task centering and facing issues honestly.

Smith, Malmo and Shagass (1954), in an EMG study of listening and talking, using psychiatric Ss and normal controls, found that all muscles recorded showed significant increases with talking. Rising and falling gradients of tension were observed in speech muscles and in extensor muscles of both arms, however, differences between patients and controls were seen only in speech muscles and then chiefly during questioning about feelings.

Their hypothesis was that EMG gradients of this kind were related to the phenomena of attention; there is also the possibility that emotional arousal due to questions regarding feelings may have created some anxiety in the patient Ss, as well, such questions may have focused attention on areas possible painful to the patients. Malmo and Davis (1954) in a study to determine whether gradients similar to EMG gradients appear in autonomic functions found that the EMG's of the extensor muscles were reliably correlated with speed of performance, as were heart rate and blood pressure. They also found significant intercorrelations between gradients of physiological functions under autonomic control and EMG gradients of the skeletal-motor system, which suggested to them that all these functions share some of the neural control mechanisms of neural control.

Bartoshuk (1956) examined EMG gradients and EEG amplitude during motivated listening to determine how the Ss arousal state is related to his task motivation and found, as Wallerstein (1954), had done, that the slopes of forehead EMG gradients correlated positively with reported interest and therefore supported the hypothesis that forehead EMG gradients indicated motivation to listen. First hearing of the story showed an increased relationship between EMG gradient and EEG amplitude but this relationship was not repeated in the second reading. Bartoshuk therefore concluded that the slope of gradients of forehead EMG's (and consequently motivation to listen) depended on both arousal state and the cue functions postulated by Hebb, Stennett (1957) was also interested in the relationship of performance levels to levels of arousal. His experiment tested the hypothesis that an inverted U relationship exists between level of arousal and performance level as has been suggested by Davis (1957), Hebb (1955), Malmo (1957, 1958), and others. Stennett used an auditory tracking task with different conditions

of incentive, low to high, and found that the data gave strong support to the hypothesis regardless of whether GSR or EMG responses of any of the four muscle groups were used as criterion of arousal. Teichner's (1957) results, which indicated that reaction time was inversely related to the magnitude of tension also supported this hypothesis.

In studies in which anxiety was an additional factor, further support was found for Wishner's concept of efficiency. Farber and Spence (1953) showed that in complex tasks non-anxious performance was superior, but that in conditioning tasks anxious Ss conditioned more quickly. Taylor (1951), Taylor and Spence (1952), as well as Welch and Kubis (1947), also found that the rate of conditioning was greater for anxious Ss. Davis, Malmo and Shagass (1954), in a study of EMG reaction to strong auditory stimulation in psychiatric patients used three groups: controls, psychoneurotics and schizophrenics. Their data revealed masseter and sternomastoid EMG responses did not differentiate between patients and controls and they suggested that the heterogeneity of response patterns in the schizophrenic group seemed mainly responsible for the absence of significant differences between the patients and the controls (Davis et. al. 1954). While the anxious group showed larger initial extensor EMG's than controls, of more significance was the fact that the patients showed an abnormal after response following the initial reflex to auditory stimulation. Malmo (1957) agreed with Wishner (1962), that the physiologic measures present themselves as useful tools in establishing and accurately quantifying a dimension of behavioural intensity, and observed that psychoneurotic patients tended to have higher levels of physiological reaction than control Ss and that levels of such reaction seemed particularly high in patients suffering from pathological anxiety.

Duffy (1957) believes that inhibitory control is an important factor in preventing impulsive disorganized behaviour, possibly such high levels of physiological reaction as were observed among patients suffering from pathological anxiety is due to loss of such inhibitory control. As Child (1954) pointed out since measures of anxiety differ in each study, it is difficult to determine if the same independent variable was being used in each study. In spite of all this each of these studies can be analyzed in terms of efficiency in a manner which makes sense of their results if the task requirements are kept firmly in mind, for, as Wishner (1955) points out efficiency in learning can be measured if the task requirements can be specified.

Relative to most other areas of psychology, task orientation or centering has been left out of the experimental picture. The concepts of task-centered or ego-centered are basic to exploration of this area and there is a possibility for considerable confusion between the concepts 'ego-involved' and 'ego-centered' motivation. As Wishner (1955) makes clear, ego involvement is generally defined in terms of interest in the task and therefore Ss cannot be regarded as egocentric in Wertheimer's or Wishner's meaning of the word, which implies a centering on the ego, to the exclusion of the task. In addition, the nature of the tasks used in most experiments seldom present inherently organized wholes (Wishner 1955) and therefore do not lend themselves to realistic task centering. Surwillo (1956) sees much of the current research as suffering from a failure to regard motor behaviour in any systematic relationship to the traditionally defined psychological processes and while MAP studies do not, in general, suffer from the general malaise of rejection or consolidation of such concepts as motivation and emotion,

there has been little explicit formulation developed. Surwillo (1956) did two studies to investigate the relationship between EMG gradients and level of motivation, difficulty and goal structuring of a task, and found incentive to be the most important factor in determining the slope of the EMG gradients. He did not, however, produce any "explicit formulation" such as he had suggested was necessary.

Reuder (1956) examined the effect of ego-orientation and problem difficulty on muscle action potentials, and concluded from her data that tension increase during problem solution was a function of the combined effect of the type of instructions and the difficulty of the problems used. Stimpson and Bass (1957) investigated the dyadic behaviour of self-interaction, and task-oreinted Ss in a test situation with some very interesting results. The interaction-oriented person was responsible for less successful performance of the required task, no matter who her partner was, whether self or task oriented. As they pointed out a similar performance by self- and task-oriented Ss, in this situation might have been expected if both these orientations (self and task) are seen as concerned with getting the job done, although for very different reasons.

The most comprehansive analysis of all the available data would seem to be that of Wishner in his various studies and although his experiments are, of his own admission, no more free from experimental error than many others, it would seem to be both interesting and worthwhile to do a study patterned for the most part on his procedures (Wishner, 1962).

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## Appendix B

## Details of Method

Initial Instructions to all subjects regarding the pre-instructional matching task.

"What we are asking you to do now is a simple reaction time test, which is a preliminary to the main body of the experiment. The telegraph key before you is to be operated by the middle finger of your preferred hand, your other hand is to remain flat and perfectly relaxed on the table. The green light on the panel is a warning light to prepare you for a quick reaction; the white light below the green one is the "go" signal. When the green light comes on you are to depress the key until the onset of the white light when you are to lift your finger off the key as quickly as possible. Try to make each movement as specific as possible. The electrodes attached to your arm record minute electrical impulses and are not designed to deliver electric shock."

Following this initial test, approximately 10-20 trials, or sufficient to establish a stable rate of response, the subjects were divided into two groups, matched as to age, sex and initial test performance.

Competitively-Oriented Group A

"This simple test has been found by other investigators to be a sensitive and accurate means of measuring your task efficiency. We are comparing your reaction-time performance with that of a group of boys your age from Oak Bay High. There is a prize to be given to the school group showing the greatest overall efficiency, that is, those with the

lowest reaction-time scores, so do your very best.

This is the same simple reaction-time test with which you have already had a brief experience. The test instructions are the same as they were initially; the telegraph key before you is to be operated by the middle finger of your preferred hand, your other hand is to remain flat and perfectly relaxed on the table. The green light on the panel is a warning light to prepare you for a quick response; the white light below the green one is the "go" signal. When the green light comes on you are to depress the key until the onset of the white light, when you are to lift your finger off the key as quickly as possible. The electrodes attached to your arms record minute electrical impulses and are not designed to deliver electric shock."

Other-centered Instructions Group B

"The experiment we are doing today is the last of a series of experiments extending over five years, and the ultimate success of all this work is very much dependent on this experiment and therefore, your performance. The way you can help the most is by doing exactly what you are asked to do, and therefore we are asking for your utmost cooperation in the following test. This is the same simple reaction-time test with which you have already had a brief experience. The test instructions are the same as they were initially; the telegraph key before you is to be operated by the middle finger of your preferred hand, your other hand is to remain flat and perfectly relaxed on the arm of your chair. The green light on the panel is a warning light to prepare you for a quick reaction; the white light below the green one is the "go" signal.

When the green light comes on you are to depress the key until the onset of the white light when you are to lift your finger off the key as quickly as possible. The electrodes attached to your arms record mimute electrical impulses and are not designed to deliver electric shock."

Shock Instructions Group C

"What we are asking you to do now is a simple reaction time test. The telegraph key before you is to be operated by the middle finger of your preferred hand, your other hand is to remain flat and perfectly relaxed on the table. The green light on the panel is a warning light to prepare you for a quick reaction; the white light below the green one is the "go" signal. When the green light comes on you are to depress the key until the onset of the white light when you are to lift your finger off the key as quickly as possible. Try to make each movement as specific as possible. The electrodes attached to your arms record mimute electrical impulses. As you know other boys from your school have taken this reaction-time test, however the average reaction time (RT) of both your school group and —— —— were surprisingly long. We want, therefore, to see if we can reduce this average RT; to do this we have selected an arbitrary level of RT and if your RT is longer than this, you will receive an electrical shock. This shock is strong enough to be quite painful so do try and make your RT to the lights as short as possible."

Method

The telegraph key is to be operated by the middle finger of the S's preferred hand and is to be placed in front of the subject. Muscle action

potentials are to be taken continuously and simultaneously from the extensor digitorum communis muscle of each arm. Bipolar readings to be taken using surface electrodes 9mm in diameter. One electrode attached 2 inches below the elbow and the second 2 inches below the first, both on the line of perceptibly maximal contraction of the muscle.

In front of the S is a panel with 2 lights on a solid brown board, the top light is green (a 6 watt bulb covered by a green reflector) and signals the S to prepare for a quick response. Principal stimulus for the reaction-time measurement comes next, a 25 watt white light below the green. This is the "go" signal. The intervals between green and white lights: 2 to 12 seconds in random order. The inter-trial interval is to be 5 seconds always. There to be 10 practice trials and 50 test trials.

A grass 7 WC-20 PA polygraph machine was used. The machine settings were as follows: Amplifier-Calibrate - 5, Sensitivity - 5, Function-Integrate, ½ low am. frequency 1; Integrator: Time Constant 2, Threshold approximately 2, Sensitivity maximum, Baseline 1; Drive Amplifier: ½ am. high frequency 75, Sensitivity 5, Baseline 2, Paper speed: 25mm/sec. electrode impedance less than 15,000 ohms.

Analysis of the MAP's in the interval between the green and the "go" lights excluding the first second after the onset of the "go" light will be reported. U tests of significance between the groups will be done since the data is clearly not appropriate to a correlational study.

Conclusion of Reaction-time Test All Groups

We now have a paper and pencil test which we would like you to complete as honestly and as accurately as possible (Taylor Manifest Anxiety Scale).

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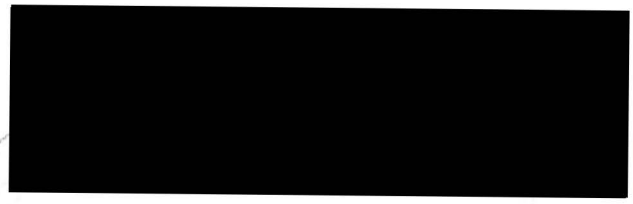
Without restriction 

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