Physiological Response, Facial Expression, and Trait Anxiety: Two Methods for Improving Consistency.

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There has been a notable lack of consistency among various measures of trait anxiety in research to date; physiological, self-report, behavioral, and expressive indices show little, if any, agreement. This report presents two potential refinements in the assessment of trait anxiety that attempt to reduce these inconsistencies and begin to offer an explanation for why trait anxiety measures have failed to differentiate groups physiologically in the past.

Method

Subjects

Forty-seven male undergraduates enrolled in introductory psychology classes participated in the experiment to fulfill a course requirement.

Apparatus

Physiological. Data were obtained for a number of physiological variables using a system designed for on-line analysis consisting of a Grass Model 7 polygraph and a PDP 11/10 minicomputer. The system enabled detection and averaging of physiological data during the course of the experiment as well as printing and storage of these data for subsequent analysis. Using this system, the following data were obtained: (a) Heart rate interbeat interval (IBI)- the electrocardiogram was detected using miniature surface electrodes placed on opposite sides of the chest; the computer timed the interval between successive heart beats in msec. (b) General somatic activity (ACT)- an electromagnetic sensor placed under the subject's chair detected movement in all planes. (c) Skin conductance level (SCL)- a constant voltage device was used to pass a small current through surface electrodes attached to the medial phalanges of the first and third fingers. (d) Pulse transmission times-photoplethysmographic devices attached to the pinna of the ear and the middle finger were used to determine the interval between the R-wave of the electrocardiogram and the arrival of the pulse wave at the ear (E-PTT) and at the finger (F-PTT). Changes in these transmission times reflect changes in cardiac contractility and/or blood pressure (Newlin & Levenson, 1979).

Nonphysiological. A continuous self-report of anxiety (ANX) was obtained during the stressor portion of the experiment through the use of an "anxiety dial" modeled after one used by Blankstein, Pliner, and Constantinou (Note 1). Subjects manipulated the dial pointer in reference to a 10-point scale anchored to a potentionmeter that produced a proportional voltage. Using a simple calibration formula, the computer was able to monitor this voltage and thus continuously track the dial position.

Procedure

Subjects were scheduled in groups for a preliminary testing session during which they completed several questionnaires, including: a global measure of trait anxiety (Spielberger, Gorsuch, & Lushene, 1969), a measure of trait anxiety in specific situations (Endler & Okada, 1975), and a measure of social desirability (Crowne & Marlowe, 1964), which was used to assess repressiveness following a procedure devel-

oped by Weinberger, Schwartz, and Davidson (1979). Using this procedure, subjects who appear to have low levels of trait anxiety on the global measure can be separated using the social desirability scale into those who are truly low-anxious (low trait anxiety scores and low social desirability scores) and those who are in reality high trait anxious but are repressive (low trait anxiety scores and high social desirability scores).

Subjects were scheduled individually for the laboratory session which constituted the second segment of the experiment. In this phase, each subject was brought into the lab, seated in a comfortable chair, and physiological recording equipment was attached. The subject was told only that he would be viewing a videotape of a film portraying several industrial accidents. The experimenter left the room and the session began. The subjects saw a blank screen during a 7-min. baseline (7 60-sec periods) the stressful film was viewed for 12 min. (72 10-sec periods) then a post-film baseline was recorded for 7-min. (7 60-sec periods). The subject's facial expressions were videotaped during the session for later scoring by a team of trained coders. Expressions were coded in 4 categories: positive (happiness); disgust; other expressions; and total number of expressions, according to criteria proposed by Ekman and Friesen (1975).

Results

Overall analysis of the physiological data indicated that the film was a stressful stimulus for the subjects; significant responses to the accident scenes were found for all physiological dependent variables, ANX, and the 4 categories of facial expressions.

Subjects were then divided in three different ways based on their questionnaire scores, and a series of 2 X 86 (Group X Period) analyses of variance were performed for each of these divisions. The first analysis, which divided the groups based on the global measure of trait anxiety alone, found no significant differences in overall levels of physiological responses, ANX, or facial expressiveness, or in responses on these measures to the accident scenes.

Subjects were then split into high and low trait anxiety groups using the "physical danger" subscale of the Endler and Okada measure. ANOVAs showed significant differences between the groups on IBI, ACT, F-PTT, other expressions, and total number of expressions in response to the film (Table 1; FIG. 1-5). Subjects who scored high on the physical danger subscale had significantly larger responses on these variables to the accident scenes, compared to those scoring low on the subscale.

In the third analysis, low-scoring subjects on the global trait anxiety measure were subdivided into "true" low anxious subjects and "repressors" using the Marlowe-Crowne scale. Significant differences in response to the film were found between these groups on IBI, F-PTT, positive facial expressions, and total number of facial expressions. "Repressors" had significantly larger physiological responses to the accident scenes, but evidenced fewer facial expressions than "true" low anxious subjects. (Table 2; FIG. 6-10).

Discussion

In this experiment we have illustrated how two different approaches to the assessment of anxiety may be applied to improve the correspondence between self-report and physiological components of the construct. In the first approach a

situation-specific measure of anxiety for situations involving physical danger was found to be predictive of individual differences in physiological and facial responses to a film in which themes of physical danger were prominent. In the second approach, subjects whose scores on a global measure of trait anxiety indicated they were low trait anxious were subdivided into "true low anxious" and "repressors" in terms of a measure of repressive style. Whereas scores on the global measure alone had failed to predict individual differences in physiological and facial responses to the film, scores on the global measure taken in combination with scores on the repression measure were predictive of differences between the two subsamples of low trait anxious subjects. Thus the veridicality of the often articulated statement that physiological and self-report components of anxiety are uncorrelated may be a function of the way in which anxiety is assessed and, in addition, the kind of anxiety producing situation which is being utilized.

An interesting ancillary finding of the present investigation was the relationship between facial expressiveness and physiological response in the various subject groupings. Previous work in this laboratory (Notarius & Levenson, 1979) has provided support for an inverse relationship between facial and physiological responsivity. In the present experiment, such a relationship was found when comparing the "true low anxious" (low physiological, high facial responsivity) and "repressor" (high physiological, low facial responsivity) groups. However, in the groups selected using the situation specific measure of anxiety, facial and physiological reactivity tended to be parallel rather than inverse. We feel that some of the inconsistencies which have emerged in the literature concerned with relationships between facial and physiological responses, may be clarified in future research if constructs such as "repressiveness" are taken into account in classifying subjects.

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Reference Note

1. Blankstein, K. R., Pliner, P., & Constantinou, K. Heart rate increases in an "incubation of threat" situation: Fear or coping? Paper presented at the meeting of the Psychophysiological Research, September, 1978.

References

1. Crowne, D. P. & Marlowe, D. The approval motive: Studies in evaluative dependence. New York: Wiley, 1964.
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Table 1.

Comparisons of High and Low Trait Anxiety Groups: "Physical Danger" Subscale

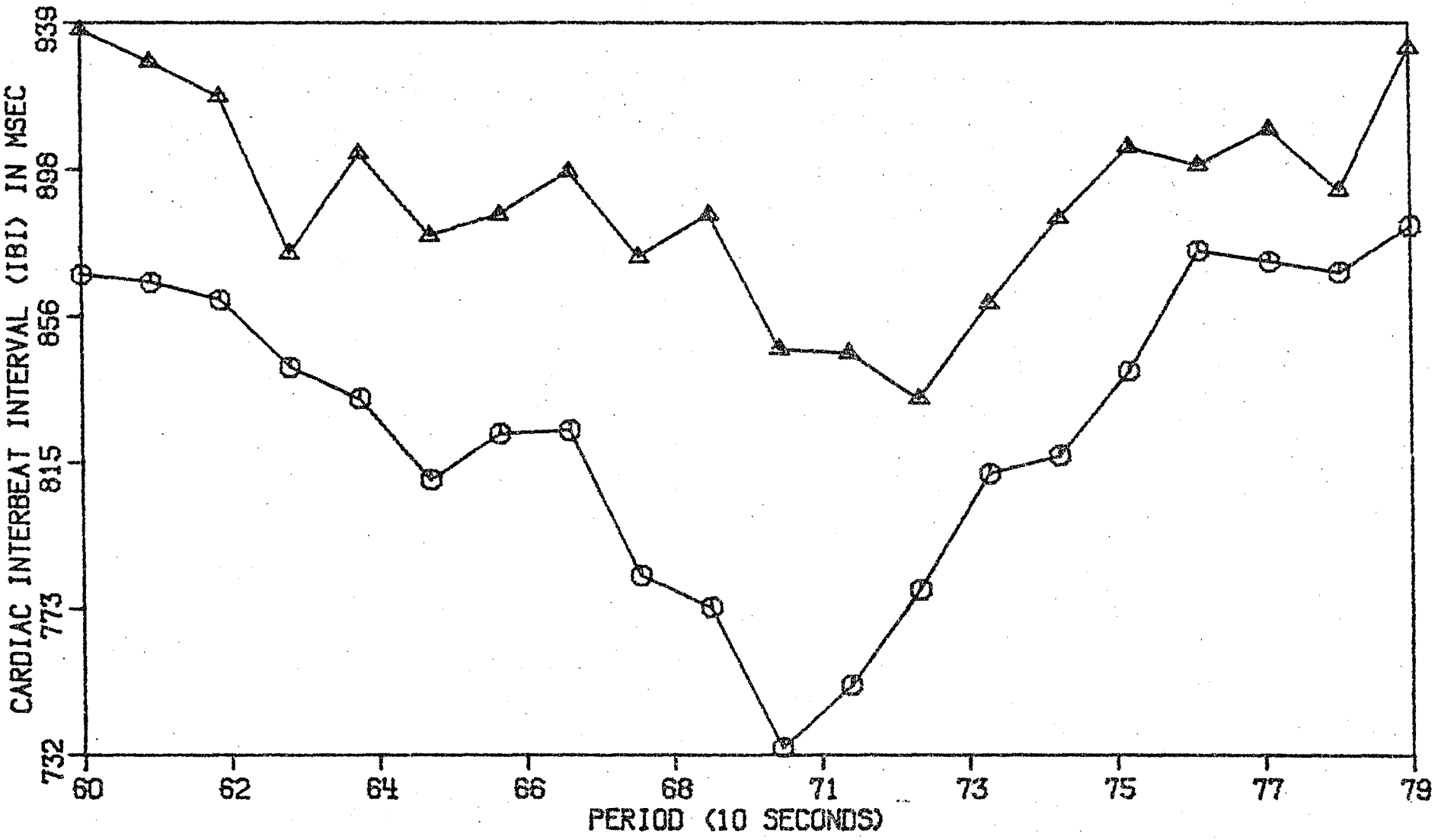
Measure	F	P
IBI (msec)	F(85,3825)=1.897	<.001
ACT	F(85,3825)=1.306	.032
F-PTT (msec)	F(85,3800)=1.407	.009
Other Expressions	F(85,3825)=1.619	<.001
Total Expressions	F(85,3825)=1.35	.019

Table 2.

Comparisons of "Repressors" and "True Low Anxious" Subjects.

Measure	F	P
IBI (msec)	F(85,2210)=1.905	<.001
F-PTT (msec)	F(85,2199)=1.515	.002
E-PTT (msec)	F(85,2125)=1.560	.001
Positive Expressions	F(85,2210)=2.281	<.001
Total Expressions	F(85,2210)=1.342	.022

RESPONSE TO THIRD ACCIDENT *IBI*



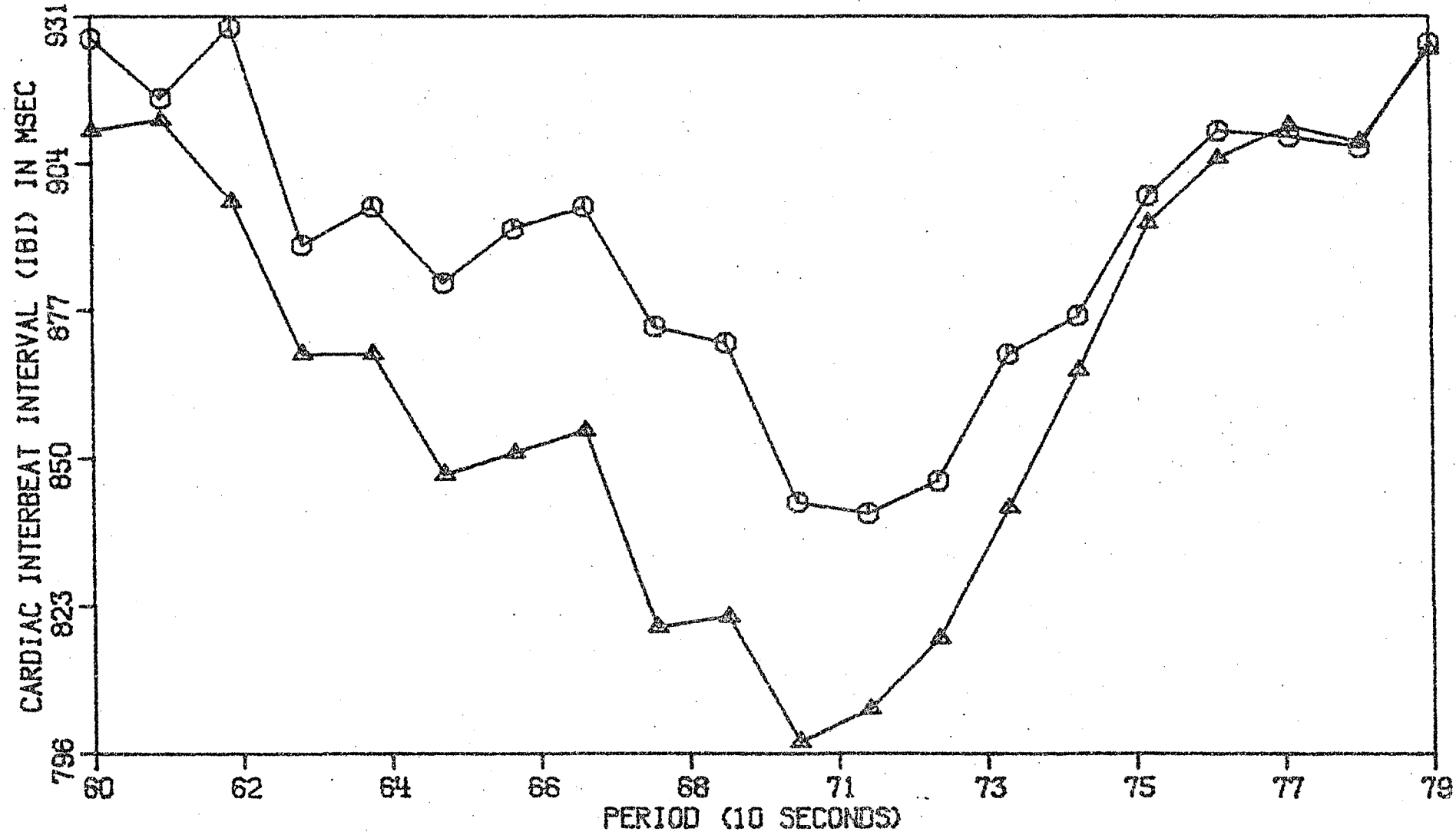
LEGEND

* REPRESSORS*
* TRUE LOW ANXIOUS*

COMMENTS

PERIODS 70-71=THIRD ACCIDENT

RESPONSE TO THIRD ACCIDENT *IBI*



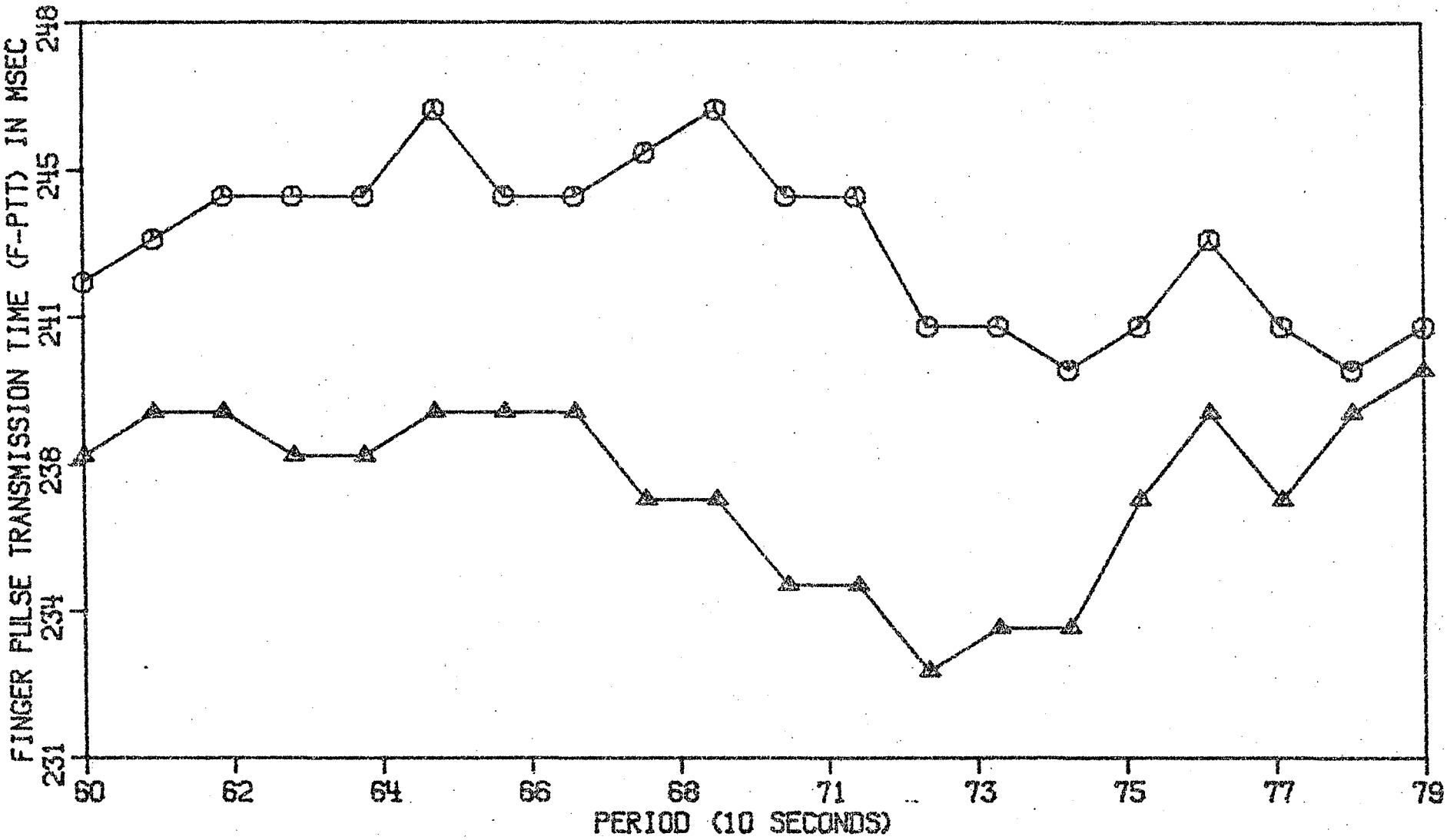
LEGEND

LOW ANXIOUS (PHYSICAL DANGER)
HIGH ANXIOUS (PHYSICAL DANGER)

COMMENTS

PERIODS 70-71=THIRD ACCIDENT

RESPONSE TO THIRD ACCIDENT *F-PTT*

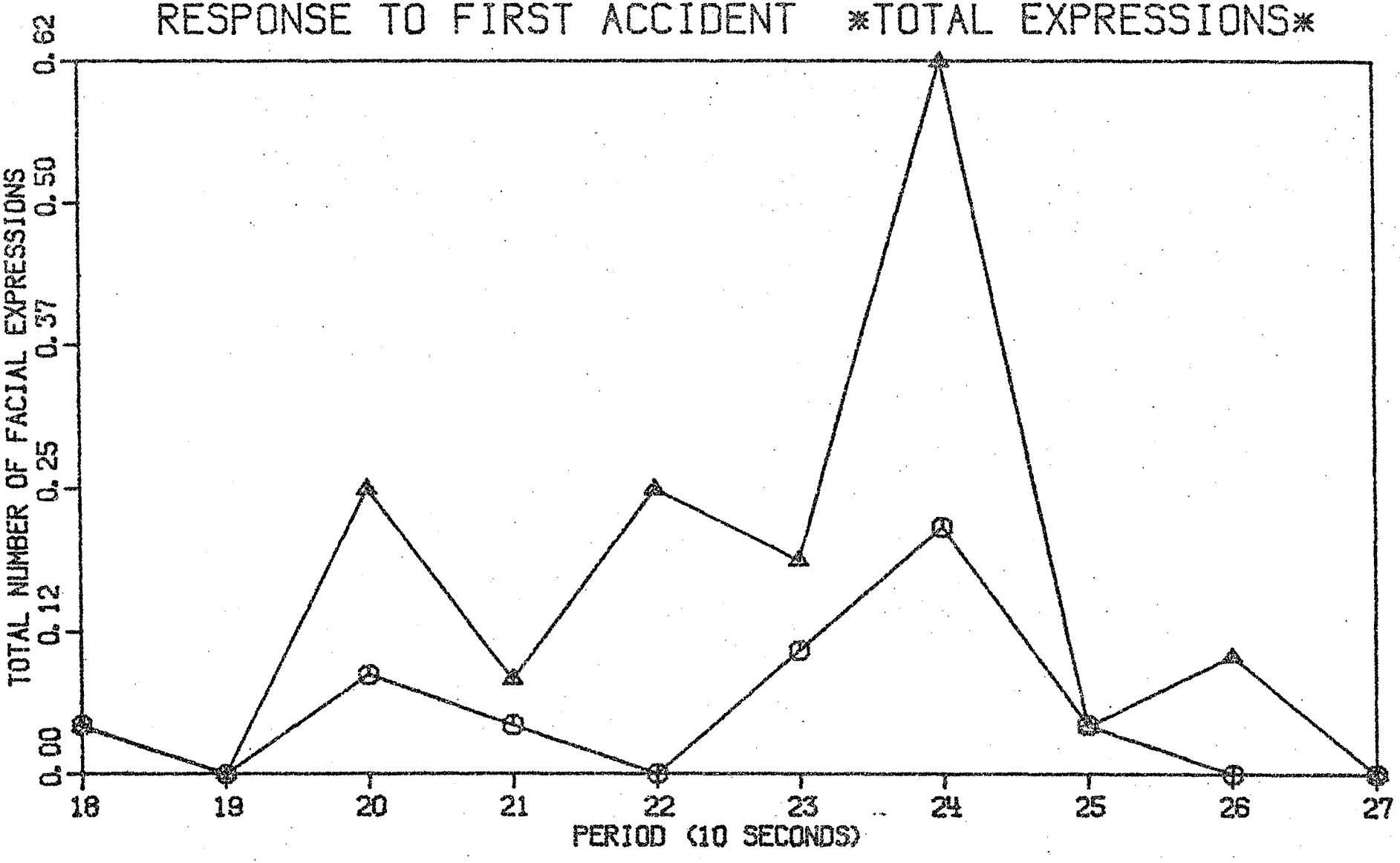


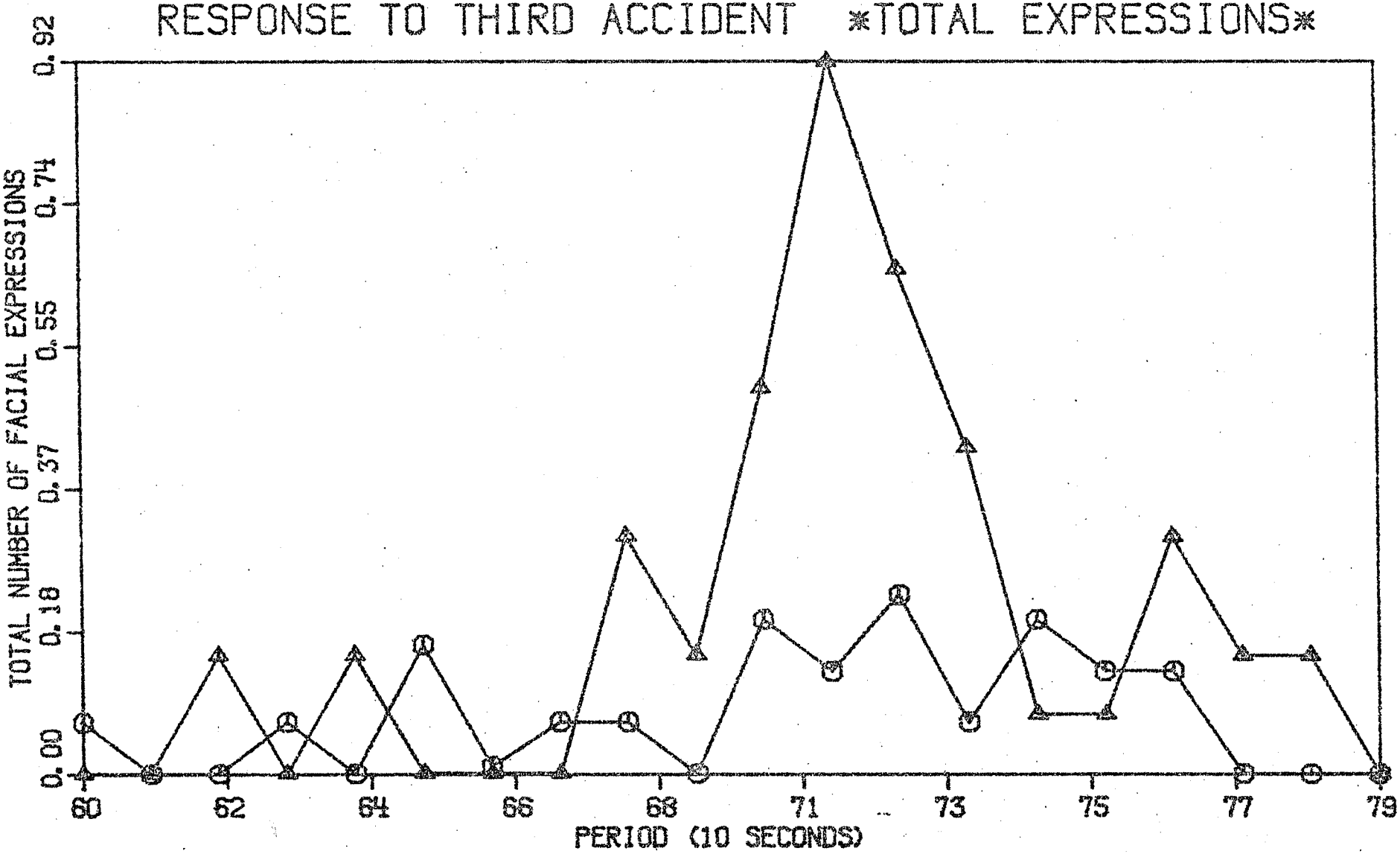
LEGEND

LOW ANXIOUS (PHYSICAL DANGER)
HIGH ANXIOUS (PHYSICAL DANGER)

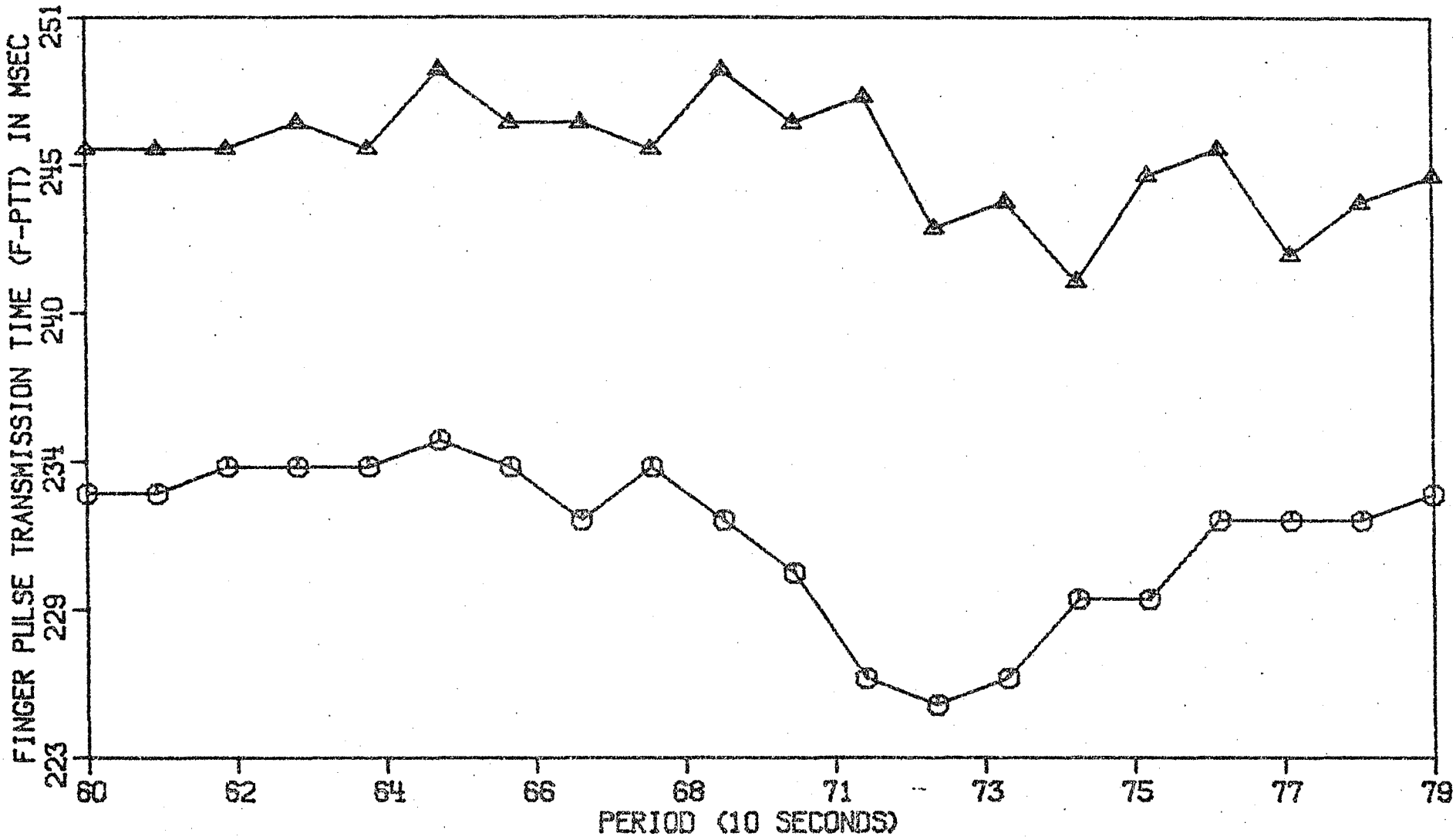
COMMENTS

PERIODS 70-71=THIRD ACCIDENT


RESPONSE TO FIRST ACCIDENT *TOTAL EXPRESSIONS*
TOTAL NUMBER OF FACIAL EXPRESSIONS
0.00
0.12
0.25
0.37
0.50
0.62
18
19
20
21
22
23
24
25
26
27
PERIOD (10 SECONDS)
LEGEND
LOW ANXIOUS (PHYSICAL DANGER)
HIGH ANXIOUS (PHYSICAL DANGER)
COMMENTS
PERIODS 23-24=FIRST ACCIDENT


RESPONSE TO THIRD ACCIDENT *TOTAL EXPRESSIONS*
TOTAL NUMBER OF FACIAL EXPRESSIONS
0.00
0.18
0.37
0.55
0.74
0.92
60
62
64
66
68
71
73
75
77
79
PERIOD (10 SECONDS)
LEGEND
REPRESSORS
TRUE LOW ANXIOUS
COMMENTS
PERIODS 70-71=THIRD ACCIDENT

RESPONSE TO THIRD ACCIDENT *F-PTT*



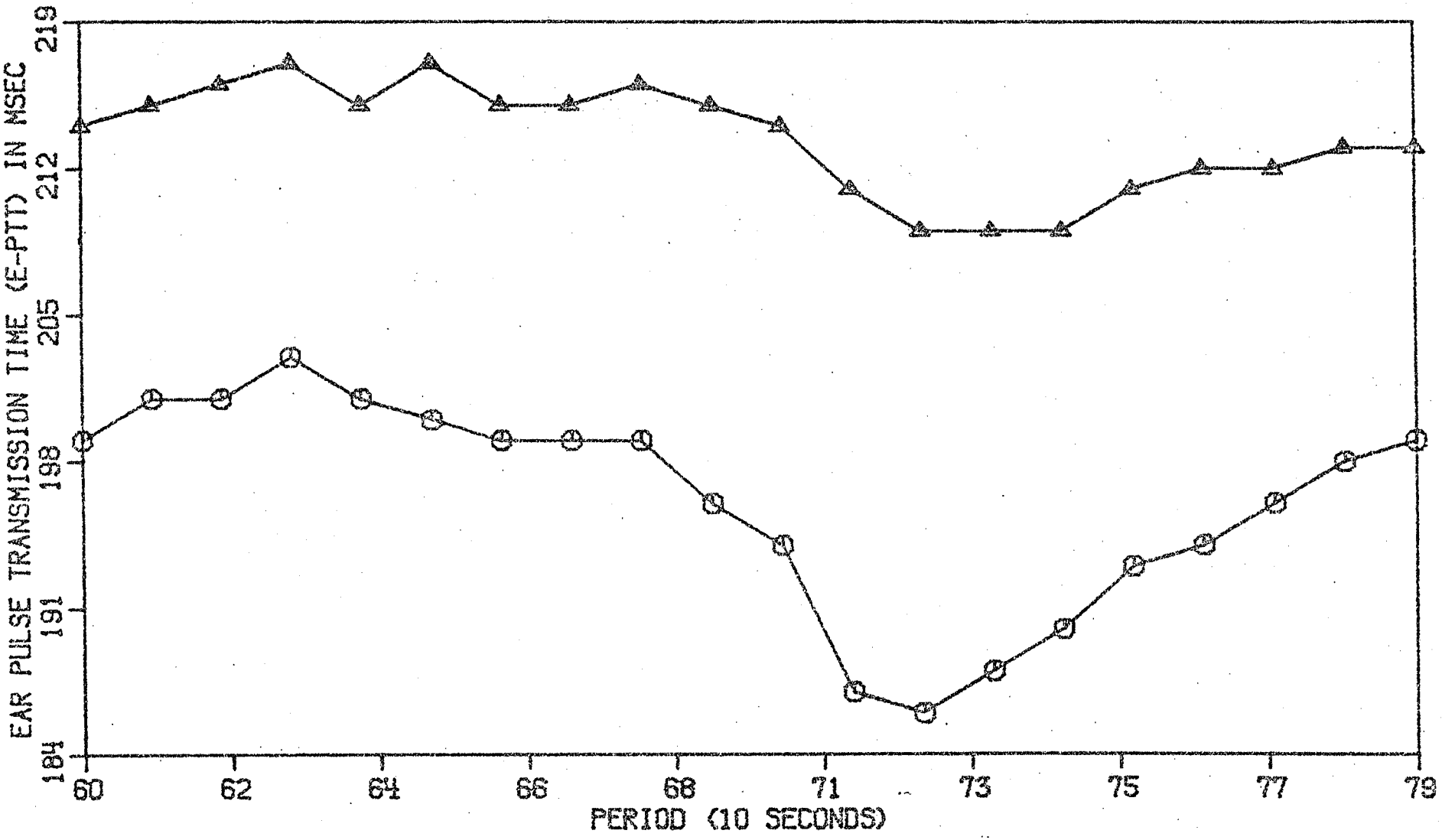
LEGEND

'REPRESSORS'
'TRUE LOW ANXIOUS'

COMMENTS

PERIODS 70-71=THIRD ACCIDENT

RESPONSE TO THIRD ACCIDENT *E-PTT*



LEGEND

'REPRESSORS'
'TRUE LOW ANXIOUS'

COMMENTS

PERIODS 70-71=THIRD ACCIDENT