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Predicting the psychological and physiological prognosis of cardiac rehabilitation patients

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The present study also addressed the American Heart Association's call to overcome the paucity of research concerning the effects of exercise on CHD patients' psychological health (Fletcher et al., 1992). An attempt was made to determine whether the frequency and duration of CHD patients' exercise would effect their anxiety and depression. The present sample did experience a reduction in anxiety and depression after six months of exercise. However, contrary to expectations, the frequency of patients' exercise was not associated with this reduction in anxiety and depression. While the duration of the present sample's exercise was not associated with their reduction in depression, it limited their reduction in anxiety. Though surprising, this result is consistent with research that has revealed an increase in anxiety following participation in an exercise programme (e.g., De Geus et al., 1993; Stern & Cleary, 1981; Van Dixhoorn et al., 1983). The physical symptoms of increased duration of exercise are similar to those of cardiovascular distress (Ledwidge, 1980; Weg, 1985). It is possible that patients associate the symptoms induced by increased duration with the symptoms of cardiovascular distress and, consequently, experience anxiety when exercising. In complying with the duration component of their exercise prescriptions, patients may also believe that they are being stretched beyond their physical abilities and are placing their lives at risk. The risk patients associate with the increased duration exercise is likely to cause anxiety. Given the present finding that exercise duration acts as an impediment to psychological recovery, the relationship between exercise and CHD patients' psychological health will require close scrutiny in future research.

Practical Implications of the Present Study

Myocardial infarction survivors constitute the largest group of people who are at risk of suffering a fatal cardiac event (Kamarck & Jennings, 1991). Indeed, some studies have shown that over 70% of sudden cardiac death victims had a prior history of myocardial infarctions (Kamarck & Jennings, 1991). It is thus imperative that every

effort is made to enhance the effectiveness of rehabilitation. A primary goal of rehabilitation is to help CHD patients regain their ability to pursue a full and productive life and reduce their risk of reinfarction. This is achieved by increasing CHD patients' cardiovascular fitness through exercise training. The present study demonstrates that the duration of exercise needs to be emphasised in exercise based rehabilitation programmes. Supervised exercise based cardiac rehabilitation programmes remain the most effective means of reducing the risk of fatal and non-fatal cardiac events and also, of reducing the behaviours that initiate these (Kamarck & Jennings, 1991). While many of the benefits of cardiac rehabilitation are intangible (Froelicher et al., 1993), the present study shows that the duration of exercise provides a primary line of defence against reinfarction (Curfman, 1993).

An additional goal of existing rehabilitation programmes is to inform patients of the relationship between risk factors (e.g., smoking, diet, sedentary lifestyle) and CHD and encourage them to change their lifestyles to eradicate these risk factors (Wright, Carbonari, & Voyles, 1992). The results of the present study suggest that this should be extended to the provision of interventions designed to modify the toxic components of Type A behaviour. While Type A components were unassociated with physiological strain in the present study, the anger-in and anger-out components predicted reduced recovery from anxiety and depression. The psychophysiological effects of anxiety and depression pose a substantial threat to an already compromised cardiovascular system (Brown & Munford, 1984; Garrity & Klein, 1975; Rejeski et al., 1985). The progression of CHD is slow with the result that the magnitude of this threat may not be apparent in the short term (Orha et al., 1985). As the focus of the present study was on the first six months of recovery, it was not possible to determine whether the negative effect of anger on anxiety and depression would have resulted in an increased risk of reinfarction in the long term. However, given the relationship between anxiety, depression and increased risk of reinfarction, future rehabilitation programmes may be enhanced by designing

interventions which alter the toxic components of Type A behaviour which impede recovery from anxiety and depression.

In identifying which of the Type A behaviours are benign, and which are toxic, the present study makes it possible to identify sub-groups within the Type A population who are at greater risk of suffering subsequent psychological strain. The present study also provides future research with a valid and reliable questionnaire that can be used to identify the individual components of Type A behaviour which are manifested by CHD patients. With this knowledge it will be possible to design intervention strategies which reduce those components of Type A behaviour which exert a deleterious effect and cultivate those which exert a positive effect (Bluen et al., 1990). Differentiation of the toxic and benign effects of the various Type A components, and the treatment thereof, has important implications for the design of rehabilitation programmes. Active, vigorous individuals are often labelled Type A's despite the fact that they do not exhibit the potentially dangerous hostility, impatience irritability and anger, characteristic of Type A behaviour (Friedman & Booth-Kewley, 1987b). It would be unfortunate if these individuals were made to alter their seemingly healthy behaviour because of the incorrect definition and assessment of Type A behaviour. Further, as achievement striving behaviour enhances self-esteem and social, economical and personal stature, modification of this aspect of Type A behaviour may have negative social and personal consequences for the individual (Cohen, 1980). Thus, from both the literature and the present findings it is evident that intervention strategies should focus on the modification of CHD patients' anger and the cultivation of their achievement striving behaviour.

Limitations of the Present Study

The results of the present study support the notion that Type A behaviour is a

multidimensional construct wherein the different dimensions exert differential effects. Also supported, is the notion that it is insufficient to view exercise compliance exclusively in terms of attendance and that it is in fact, the duration of exercise which predicts changes in cardiorespiratory condition. It is possible, however, that the value of this research is limited by several flaws in the conceptualisation of the model, the composition of the sample, the study design and the methodology employed. The various limitations, together with suggestions for future research, are outlined below.

The present research addresses a fundamental weakness of past Type A research by examining the multidimensional, and not the global, nature of the construct. Hostility has also been erroneously conceptualised and treated as a global construct (Thoreson & Powell, 1992) where, in fact, it is multidimensional (Suarez & Williams, 1990). While the present research does not make the mistake of examining hostility globally, it includes only one dimension of the construct, namely, acting-out hostility. The measure of acting-out hostility is consistent with the original definition of Type A behaviour (Friedman & Rosenman, 1974) and the type of hostility associated with CHD (Carmody et al., 1989; Dembroski & Costa, 1987). However, it is possible that other dimensions of hostility (e.g., potential for hostility, cynical hostility; neurotic hostility) exert differential effects on other, equally salient outcomes of CHD diagnosis (Suarez & Williams, 1990). For example, past research has demonstrated that neurotic hostility predicts CHD patients' anxiety (e.g., Siegman et al., 1987). Given the likelihood of differential effects, future research should both specify and consider the predictive role of all dimensions of hostility on the various different psychological and physiological outcomes seen in samples of CHD patients.

A further limitation concerns the possible incorrect composition of the sample. For example, Carney et al. (1987) have found that depression is related strongly to CHD.

Other studies (e.g., Carney, Rich & Freeland, 1988) have shown that depression is an independent predictor of secondary cardiac events, while the results of Powell et al.'s (1993) study suggest that depression is associated with CHD mortality. Research also suggests that anxiety is a precursor of CHD (Matthews, 1982; Nielson & Dobson, 1980). Friedman and Booth-Kewley's (1988) meta-analysis shows that both anxiety and depression are reliably associated with CHD. Thus, future models should also consider anxiety and depression as potential predictors of CHD.

It has been argued in the present research (see Chapter 4) and elsewhere (e.g., Ganster et al., 1991), that it is the heightened cardiovascular reactivity associated with the toxic components of Type A behaviour that predisposes individuals to CHD risk. It has also been argued that these behavioural components occur in response to excessively challenging environmental situations (Price, 1982). Should this be the case, then any attempt to determine a conclusive relationship between Type A components and CHD risk, or Type A's response thereto, should include an assessment of the quality, frequency and intensity of excessively challenging environmental stimuli experienced by CHD patients (Suarez & Williams, 1990). While such measurement was beyond the scope of the present study, future research should identify and quantify challenging environmental stimuli and assess these in relation to CHD. Such research might provide evidence for the belief that acute stressors precipitate sudden cardiac death in humans in the same way as they have been found to do in animals (Kamarck & Jennings, 1991).

Several limitations of the present study are imposed by the demographic composition of the sample. By only including a small number of women, the present study can be criticised for contributing to the paucity of information concerning all aspects of cardiovascular disease and rehabilitation in women (Chesney, 1993; Wenger et al., 1993). Women of childbearing age have been excluded from past research as have elderly women who frequently have coexisting diseases (Wenger,

1992). Further, the less frequent use of intensive or invasive diagnostic and corrective treatments for CHD in women than men (despite an equal severity of CHD) (Ayanian & Epstein, 1991) has contributed to the fact that fewer women find themselves included in studies of secondary prevention. Similarly, less women than men are referred to exercise based rehabilitation programmes by medical practitioners despite the fact that the therapeutic benefit is equal for both sexes (Oldridge, LaSalle, & Jones, 1980). Those females who are referred for rehabilitation, tend to comply with the programme to a lesser extent than their male counterparts because of a higher frequency of coexisting illnesses, familial responsibilities and various other psychosocial factors (Powell et al., 1993; Wenger et al., 1993).

The rate of CHD morbidity and mortality among women is substantial and increasing (Johnson & Morse, 1990; Wenger, Speroff, & Packard, 1993). The prognosis following either medical and surgical therapy for CHD is poorer for women than for men (Wenger et al., 1993). Further, the incidence of early death following myocardial infarction (Greenland, Reicher-Reiss, Goldbourt, & Behar, 1991; Lerner & Kannel, 1986) and the rate of in-hospital deaths after cardiovascular surgery is higher among women than men (Loop et al., 1983; Weintraub, Wenger, Jones, Craver, & Guyton, 1992). The magnitude of the association between Type A behaviour and CHD is also as strong for women as it is for men (Miller et al., 1991). However, recent research (e.g., Norris, deGuzman, Sobel, Brooks, & Haywood, 1993; Powell et al., 1993) suggests that the psychosocial predictors of secondary CHD mortality among women differ considerably from the standard predictors of mortality among men. In the present study, t tests did not yield any significant differences between men and women on the Type A and exercise predictor variables. Further attempts to reveal any differences between male and female CHD patients' changes in anxiety, depression and maximal oxygen uptake by means of t tests, also failed to yield significant results. From the results of the t tests conducted in the present study, it is evident that there are no differences in the male and female

psychological and behavioural predictor variables and in their psychological and physiological outcome variables. However, given that past research has revealed different relationships between psychosocial predictors and secondary CHD mortality among men and women, it is advisable that the relationship between personality, behaviour and CHD as it applies to women be examined in greater detail (Wenger et al., 1993). What is needed is sex specific research concerning the psychosocial factors associated with the cause, prevention, treatment and prognosis of CHD in women (Chesney, 1993; Wenger et al., 1993).

A second limitation imposed by the sample concerns the under-representation of black CHD patients. Cross-sectional research shows that the distribution of Type A behaviour among white samples is equal to that found in black samples and that the association between behaviour, CHD risk factors and CHD outcomes is the same for both races (Anderson et al., 1986; Thoreson & Powell, 1992). Research conducted in the United States (Becker et al., 1993) has shown that the incidence of CHD is significantly greater among blacks than among whites and that blacks have a significantly lower rate of subsequent survival. In comparison to whites, blacks undergo less invasive cardiac procedures such as coronary artery bypass grafts, percutaneous transluminal angioplasty and cardiac catherisation (Whittle et al., 1993). Research into the incidence of risk factors and mortality among, black, white and Latina women has established a differential distribution of clinical outcomes according to race (Norris et al., 1993). There is thus a racial difference in the contraction and survival of CHD wherein blacks receive less of the treatment necessary to relieve symptoms and enhance prognosis (Ayanian, 1993). The lower survival and treatment rates is paralleled by the under representation of blacks in research (Becker et al., 1993; Keil et al., 1993). Indeed, there is a relative paucity of information regarding racial differences in the risk of contracting CHD and in subsequent survival rates (Becker et al., 1993). In view of this deficiency, t tests were conducted in the present study to compare blacks and whites on the predictor

and outcome variables. No significant differences were found between blacks and whites on the psychological and behavioural predictor variables. The t tests also failed to reveal any significant differences between the two racial groups' changes in anxiety, depression and maximal oxygen uptake. However, given the potentially higher risk indicated in past research (e.g., Becker et al., 1993), it is imperative that future research identify those factors which render different race groups particularly prone to CHD.

The medical heterogeneity of the sample constitutes both a strength and a weakness of the present study. The present sample is characterised by a wide variety of types and combinations of cardiac events and surgical procedures. While this increases the generalisability of the study, it decreases the specificity of the results. There is evidence to suggest that the various cardiac events and interventions are associated with different risk factors and outcomes (Wright, 1992). For example, CHD patients who are subjected to surgery (e.g., coronary artery bypass graft and percutaneous transluminal angioplasty) have a better psychological and physiological prognosis than patients whose treatment is limited to medication (Soloff, 1978a). The psychological and risk factor profile, and the consequent outcome, may then vary according to the underlying type and treatment of disease. In view of this, the medical heterogeneity of the present sample may have confounded the results. To address this issue, two subgroups of patients were created and compared on the outcome variables by means of t tests. The first group comprised patients who had only experienced a myocardial infarction while the second comprised those patients who had undergone a coronary artery bypass graft, percutaneous transluminal angioplasty or coronary artery angiography but had not experienced a myocardial infarction. Results of the t tests showed no significant difference between the two groups' changes in anxiety, depression and maximal oxygen uptake. This suggests that the results of the present study were not influenced by the type and treatment of CHD. However, in view of the potential difference between groups (Soloff, 1978a;

Wright, 1992), future research should examine the relationship between Type A and exercise components and psychological and physiological outcomes within specific sub-groups of CHD patients and compare these to other groups (e.g., myocardial infarction *vs.* coronary artery bypass graft patients). In taking this step, future research would be able to separate the effects of the various Type A and exercise components on the different disease endpoints.

A related weakness is the examination of the Type A construct within the exclusive context of CHD. While the association between Type A behaviour, the components thereof, and CHD is well documented, it is possible that the construct is equally predictive of other diseases (Wright, 1992). Future research should compare the relationships between Type A components and psychological and physiological morbidity found in CHD samples with samples comprising both healthy and other disease groups. Examples of diseases, which might be associated with Type A behaviour and therefore, should be considered in future research, include asthma (Everaerd, Vroman, & van der Elst, 1990), hypertension (Godaert (1990), peptic ulcers, thyroid disorders and rheumatoid arthritis (Rimé et al., 1989). Only by comparing the relationships between Type A behaviour and various different diseases will it be possible to establish whether the Type A components are specifically associated with CHD, or are, in fact, risk factors for disease in general.

The design of the present study constitutes a further limitation. Given that replication remains the most robust form of validation (Grossarth-Maticek & Eysenck, 1991), use of a control group would have enhanced the scientific validity of the present study. It has been argued in the present research and elsewhere (e.g., Evans, 1990; Ragland & Brand, 1988b) that the Type A behaviour demonstrated by CHD patients is inherently different to that which is displayed by healthy individuals. Further, the association between Type A behaviour and CHD is far greater among healthy samples than it is among CHD samples (Miller et al., 1991).

Demographic factors such as sex, age or culture may alter the strength of the relationship between Type A behaviour and CHD, and consequently, bias the results according to the demographic characteristics of the sample (Miller et al., 1991). A matched controlled study would reveal whether there are differences in the behaviour demonstrated by healthy individuals and CHD patients and whether this has a differential effect on health. The incorporation of a control group would also help determine the efficacy of the rehabilitation programme (Oldridge, 1988). While ideal, the inclusion of a matched sample of healthy subjects in the present study was beyond the scope of the present research.

A further number of limitations are associated with the present study's reliance on self-report measures of Type A components. Same-source effects may have inflated the correlations between psychological variables (Terry, 1992). The use of self-reports may have generated further sources of bias. For example, in seeking both an explanation and repentance for their condition, CHD patients are suspected of exaggerating their risk related behaviours such as anger and impatience irritability (Evans, 1990; Wright, 1992). This syndrome may result in an inaccurate inflation of scores derived from self-report measures of Type A components. In turn, this could result in positive and significant correlations between the Type A components and disease which are a product of patients' exaggerated perceptions and not their behaviour *per se* (Wright, 1992).

A second source of bias concerns the negative connotations associated with Type A behaviour which may result in socially desirable responses (Tett et al., 1992). As a means of maintaining high self-esteem, Type A's typically describe themselves in a self-appreciatory manner (Furnham, 1990b). Type A's also tend to recall more positive than negative traits about themselves (Furnham, Borovoy & Henley, 1986). As a consequence, desirable traits such as ambition and achievement striving are over-reported (Emmons & McAdams, 1991) and negative traits such as time-urgency

and aggressive-hostility are under-reported (Furnham, 1990b). Thus, there is a strong possibility that Type A's responses to self-report Type A measures are tainted by their need to maintain self-esteem, and this influence undermines the accuracy of measurement (Furnham, 1990b). The influence of social desirability may be one of the reasons why self-report measures of Type A behaviour are poorly correlated with CHD (Miller et al., 1991).

A related issue is that many of the studies (e.g., Anderson et al., 1986; Svebak et al., 1992) which have revealed an association between Type A components and indices of CHD have been based on the Structured Interview (Rosenman et al., 1964a, 1964b). The Structured Interview is considered to be the most accurate measure of Type A behaviour and to possess the strongest predictive validity for CHD (Ganster et al., 1991; Palmer et al., 1992). The Structured Interview is far better able to predict physiological strain than the self-report measures of Type A behaviour (Palmer et al., 1992). Given the relative power of the Structured Interview, it is possible that, had it been used in the present study, relationships between the individual Structured Interview factors, hostility, anger, and impatience and maximal oxygen uptake would have occurred. However, the Structured Interview could not be used in the present study for the following reasons. First, the Structured Interview is impractical for use in large sample studies (Ganster et al., 1991; Newton & Keenan, 1990) such as the present one. The primary reason for this is that the Structured Interview requires the use of audio-visual equipment, 15 to 20 minutes for administration and approximately the same amount of time for scoring (Abbott & Peters, 1988). Second, the Structured Interview can only be administered by specially trained, certified interviewers (Abbott & Peters, 1988). As this training is currently unavailable in South Africa it was not possible to use the Structured Interview in the present study. It is primarily for these reasons that a self-report questionnaire presented the only option. Though there are a number of limitations

associated with the use of questionnaires, they have been found to predict health outcomes in general, and CHD in particular (Powell, 1987).

The number of assumptions tests show that four of the measures of the Type A components are particularly robust. The same tests indicate that the fifth, acting-out hostility, while statistically acceptable, is less robust than the others. In particular, the data was not as close to linear as would have been ideal. Use of the acting-out subscale of the HDHQ may have limited the possibility of identifying relationships between hostility and changes in anxiety, depression and maximal oxygen uptake in the present study. The standardisation of the HDHQ for normal adults, and consequently its validity, is considered by some (e.g., Henderson, Davidson, Lewis, Willard, & Baikie, 1977) to be deficient. The psychometric weaknesses of the HDHQ highlighted by past research may have accounted for the relatively lower reliability coefficient (see Table 8.2) and coefficient of congruence and higher root mean square (see Table 8.7) of the hostility subscale in the present study. Despite the fact that the inherent psychometric weaknesses of the HDHQ may have compromised the reliability coefficient and the comparison statistics, the acting-out hostility subscale still demonstrated acceptable reliability and factor stability across samples, and consequently an absence of measurement error.

The relative inconsistency of the Type A Component Questionnaire across samples constitutes a potential limitation of the present study. In the second study of the present research, the data was subjected to confirmatory factor analysis. Five methods of factor extraction were used, namely, Kaiser's eigenvalue greater than one criterion, Kaiser's MSA criterion, the communality estimate, component saturation, and Cattell's scree test. The analysis yielded a five factor solution comprising 26 items. In the third study, the 26 items were subjected to the same five methods of factor extraction. One of these items generated a communality estimate below the .20 cut off, while a second failed to load on any of the five factors. These two items

were eliminated from the analysis conducted in study three. It can be argued that the inconsistency of the questionnaire across samples undermined its construct validity.

An aim of factor analysis is to reduce the number of variables to the extent that the information present in the original set of variables is retained (Guadagnoli & Velicer, 1988). With confirmatory factor analysis it is possible to determine whether the selected items tap the constructs defined prior to analysis (Welch et a'., 1990). Therefore, confirmatory factor analyses serves to test the conceptual hypotheses concerning the proposed factor structure of a construct (Briggs & Cheek, 1986). In the present research, the nature of the five factors remained consistent over samples (see tables 7.2 and 8.6). As the items tapped the *a priori* operationally defined constructs in both samples, the conceptual hypothesis was supported. The similarity of the factors across samples further suggests that essentially all of the information of the original set of variables was preserved in the second set of variables. Thus, it can be argued that the elimination of the two items which failed to meet the extraction criteria refined the questionnaire rather than undermined its construct validity.

The six month time period used in the present study may have limited the potential for finding significant changes in psychological strain. Several studies (e.g., Palmer et al., 1992; Ragland & Brand, 1988b) have shown that both the global Type A measure and specific Structured Interview derived components such as hostility, anger and impatience do not predict recurrent CHD in the year following a coronary event. Some studies (e.g., Shephard et al., 1985) have shown that the aerobic power gains in the first year of exercise are relatively small. The results of these studies may explain why other studies (e.g., De Geus et al., 1993) have failed to reveal a relationship between exercise and enhanced psychological condition. The average maximal oxygen uptake gain of 15% seen in the present study was modest (De Geus

et al., 1993). Thus, with the focus of the present study being on the first six months of exercise compliance it is possible that the gains in aerobic power where of too low a magnitude to exert an effect on psychological health. While the American Heart Association (Erb et al., 1979) maintains that six months of exercise will result in the physical reconditioning of most CHD patients, it is possible that more time is required for the improvements in physical condition to effect psychological health.

Studies (e.g., Barefoot et al, 1983; Haynes et al., 1980) which have used a longer period of follow-up have shown that Type A components predict physiological strain. The duration of the present study may have been too short to detect any such chronic relationship between the toxic components of Type A behaviour and an increasingly, compromised cardiovascular system. It is possible then, that a longer follow-up period would have revealed an association between the components of Type A behaviour and recurrent CHD. However, cognisance must be taken of the fact that the longer the time period, the greater will be the effect (Kerlinger, 1986). With longitudinal studies, time constitutes an additional variable and it is difficult to determine whether any changes that occur in the outcome variables are the result of the effect of the predictor variables or of time itself (Kerlinger, 1986). Therefore, it is suggested that future research examine the long term effects of Type A components on physiological health while simultaneously controlling for the effects of time.

The analysis component of the present research is also characterised by several limitations. A primary limitation of multiple regression, and indeed, all regression techniques, is that while it is able to establish relationships, it is unable to confirm the causal mechanisms underlying these (Montgomery & Peck, 1982). Moreover, the success of stepwise multiple regression is contingent on distributional assumptions (Montgomery & Peck, 1982). This dependency renders multiple regression particularly sensitive to sampling bias (Carmody et al., 1989). To ensure that the

independent variables examined in the present study comprise the best set of predictors of the outcome variables, and consequently, that the regression model is robust, this variable set must be applied to additional samples (Carmody et al., 1989). Application of the present model to additional samples was beyond the scope of the present study.

The present study can be criticised for using a .60 cut off point for reliability tests. While Nunnally (1967) maintains that a cut-off point of .60 is sufficient, others (e.g., James & James, 1989) state that a minimal cut-off point of .70 is required to confirm reliability. In the present study, the achievement striving, impatience irritability and acting-out hostility measures fall short of the more stringent .70 cut-off point. However, it must be remembered that, because they comprise items of different response lengths, the reliability of the measures of Type A components is assessed not by the customary Cronbach's Alpha, but by Kristof's formula. Unlike Cronbach's alpha, which reflects the most conservative estimate (Cortina, 1993), Kristof's formula provides a more exact, measure of internal reliability (Gilmer & Feldt, 1983). Given the precision with which Kristof's formula estimates reliability, it is believed that the use of a .60 cut-off point will not have disguised the existence of any measurement error in the present study.

A further limitation concerns the argument of statistical significance versus statistical meaning. While the relevant correlations are significant, the meaning of this significance is limited by their small sizes. Similarly, the relatively small amount of variance explained suggests that while the predictor variables account for a significant amount of the variance in the dependent variable, a relatively small amount of variance is explained by the independent variables included in the model.

The inclusion of additional key variables (e.g., perceived control, competition) in future models may increase the amount of explained variance.

Conclusion

The coverage on Type A behaviour in the popular press has been so extensive that the construct has become an almost endearing excuse for excessive, often commercially desirable, but potentially destructive behaviour (Gordon & Gibbons, 1991). It is the potential for destruction which dictates that this perception should not be allowed to persist. Nor too, should the construct be discarded because of past inconsistency and controversy. Clearly, the questionable credibility of the construct in the past can be attributed to the inaccurate conceptualisation and measurement of the Type A construct (Thoreson & Powell, 1992).

The results of the present study concerning the Type A components demonstrate that Type A behaviour has negative concomitants (Steinkamp, 1990) which are associated with similarly negative affective disorders (Lee, 1992). By redefining the construct as multidimensional and using a psychometric measure which adequately reflects these in the present study it was possible to demonstrate that the components of Type A behaviour do in fact, impose a significant and differential effect on anxiety and depression. Due to a number of limitations, the present study was unable to determine whether the components of Type A behaviour exert similar effects on physiological health. By overcoming these, future research may be able to establish whether Type A components also exert differential effects on physiological condition.

The relationship between the aerobic fitness generated by regular exercise, be it during work or leisure, and reduced risk of CHD has been demonstrated by past research (De Geus et al., 1990). However, while the scientific and popular literature extol the virtues of exercise, it has been unable to determine precisely how exercise effects physiological condition (Desharnais et al., 1993). The present study reveals that it is the duration, and not the frequency, of exercise which is the key determinant of cardiovascular fitness. The present study also shows that change in anxiety is influenced negatively by the duration of exercise compliance and that neither the frequency nor duration of exercise predicts a change in depression. While numerous physiological, biochemical and psychological theories have been proposed to justify the relationship between exercise and psychological health, none has received conclusive empirical support and therefore, the possibility that exercise offers little more than a placebo effect on psychological condition cannot be denied (Desharnais et al., 1993). This possibility will need to be investigated in future research.

In conclusion, stress is an inherent part of life requiring ongoing adaptation (Cohen, 1981). It also remains a primary risk factor for CHD (Grossarth-Maticek & Eysenck, 1991). It follows then, that any disposition liable to enhance the experience and consequences of stress requires attention. So too, does any factor able to mediate the negative effects of stress. Despite the existence of a considerable volume of research, knowledge of the process of adjustment to CHD remains fragmented (Johnson & Morse, 1990). Therefore, it is imperative that research continues to explore the relationships between Type A components, exercise and the psychological and physiological health of CHD patients. To this end, a refined model of the predictors of CHD patients' psychological and physiological health is

developed in Chapter 9. Incorporating the present findings with additional variables likely to influence prognosis, the model proposed in Chapter 9 outlines the implications for future research concerning CHD patients.

CHAPTER NINE

FUTURE RESEARCH IMPLICATIONS: TOWARD A REFINED MODEL OF CHD PATIENTS' BEHAVIOUR

The aim of the present research was to identify key factors involved in the process of recovery from CHD and establish the extent to which these predict prognosis. Two areas were examined, namely, Type A behaviour and exercise. The present research arose out of past research's failure to assess adequately these areas within the context of cardiac rehabilitation. On the one hand, Type A research has been limited by the inaccurate conceptualisation and measurement of the construct (Edwards et al, 1990a). Research which has conceptualised and measured Type A behaviour as a multidimensional construct has not examined the differential effects of the components on CHD patients' prognosis for recovery. On the other hand, extant research into the influence of exercise on CHD patients' psychological and physiological health is inconclusive and marred by methodological weaknesses (e.g., Kavanagh et al., 1977; NEHDP, 1981; Shephard et al., 1981; Valliant & Asu, 1985). In the present thesis, three studies were conducted to address these conceptual and empirical limitations of past research.

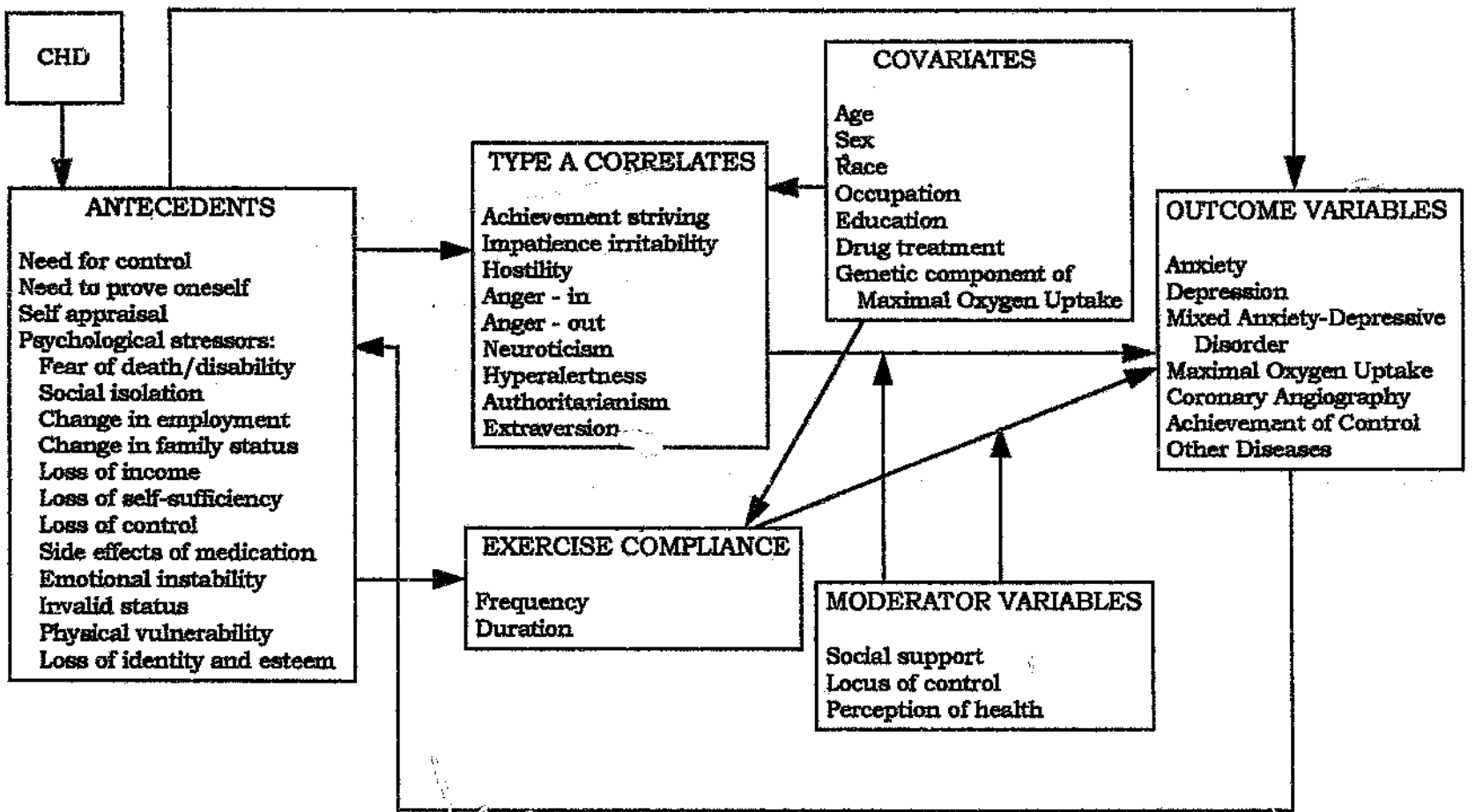
The first study compared the changes in anxiety and depression and the number of secondary cardiac events and associated surgical procedures of 20 cardiac patients who had completed a six month exercise programme with 20 who had been admitted to, but elected to withdraw from, the same programme for reasons other than ill health. No significant differences between the experimental and control groups' change in anxiety and depression and number of cardiac and surgical events were found. In the second study, the Type A Component Questionnaire was developed and validated to measure five of the key Type A components manifested by CHD patients, namely, achievement striving, impatience irritability, acting-out hostility, anger-in and anger-out. Thus, the second study generated a reliable and

valid self-report scale comprising independent measures of five of the primary components of the multidimensional Type A construct. The third study developed and tested a model of exercise compliance and Type A components as predictors of the psychological and physiological strain manifested by cardiac rehabilitation patients. This study supported the hypothesis that the predictors were differentially and independently related to psychological and physiological outcomes. However, the value of the model depicted in Figures 8.1 and 8.2 is limited by its exclusion of variables which are potentially central to the process of adjustment and to the prediction of prognosis. Therefore, the aim of Chapter 9 is to extend the present thesis to include additional factors likely to influence prognosis, and consequently, identify areas for future research. As can be seen from Figure 9.1, the model synthesises the variables examined in Study 1, 2 and 3 with antecedents, covariates, moderator and outcome variables not considered in the earlier model. A discussion of these and some of the key findings of the present research and the corresponding implications for future research follows.

Antecedents

The present research establishes that Type A behaviour comprises both toxic and benign components. With this knowledge, future rehabilitation programmes will be able to design interventions which simultaneously modify those components which exert a negative effect, and cultivate those which exert a benign effect. However, given the tenacity of Type A behaviour, it will only be possible to design interventions which generate enduring change if the primary personal and environmental factors which motivate and maintain these components are known (Price, 1982). Knowledge of these components will also prove crucial to understanding Type A's potential increased risk of CHD (Strube, 1988). Hence, the revised model makes provision for antecedent variables. It is in the theoretical formulations of Type A behaviour provided by Glass (1977a), Price (1982) and Strube (1987) that the primary antecedents can be found.

Figure 9.1
Revised Model of the Causes and Consequences of CHD Patients' Behaviour



As the need for control is a factor underlying much of Type A behaviour (Lee et al., 1990), it is included in the revised model as an antecedent. Glass' (1977a) model of the need for control has been discussed in Chapter 4 and will not be repeated here. Suffice to say that CHD undermines Type A's sense of control (Johnson & Morse, 1990). Consequently, the process of adjustment to CHD is dominated by the struggle to re-establish a sense of control (Johnson & Morse, 1990). It is in the struggle to achieve this control that achievement striving, impatient, irritable, hostile and angry behaviours manifest themselves (Matthews, 1982). The need to control the process of adjustment to CHD also increases compliance with an exercise based rehabilitation programme (Soloff, 1978a; 1978b). However, the act of struggling to achieve control may influence metabolic functions to the extent that it increases the risk of CHD (Friedman & Rosenman, 1959). Therefore, the response to control can be seen as both an antecedent of Type A and compliance behaviour and as a potential source of physiological strain.

A related factor likely to generate and maintain achievement striving, impatience irritability, hostility, anger-in and anger-out is Type A's style of self-evaluation, which has at its core the need to prove oneself (Matthews, 1982; Price, 1982). In one of the most comprehensive theoretical models of Type A behaviour, Price (1982) asserts that much of Type A's behaviour is motivated by dysfunctional personal beliefs, arising out of socio-cultural values. Specifically, Type A's believe that vital resources are in scarce supply, the environment in which they find themselves is essentially hostile and that there exists no universal moral principle. These beliefs dictate that Type A's constantly try to prove and evaluate themselves in terms of excessively high standards of performance. They are also associated with Type A's fear that they will be judged unworthy if they fail to achieve sufficient observable accomplishments. Together, these beliefs motivate Type A's to achieve increasingly higher goals and to direct impatience irritability, hostility, and anger at anyone or anything which threatens to hinder their ability to do so. The need to prove oneself

is also likely to influence Type A CHD patients' exercise performance through over compliance, though research has yet to examine this relationship. While Price's (1982) model is revered and referred to extensively in the Type A literature, little attempt has been made to test whether Type A CHD patients' style of self-evaluation stems from these beliefs and whether the need to prove oneself is in fact an antecedent of the various Type A and exercise compliance components (Yuen & Kuiper, 1992). Hence, the inclusion of the need to prove oneself in the revised model.

Strube's (1987) model of self-appraisal is also based on the premise that a dysfunctional style of self-evaluation spawns many of the Type A behaviours (Yuen & Kuiper, 1992). This model asserts that Type A's consider the achievement of goals to be contingent on acquiring accurate appraisals of their abilities (Strube, 1987). Consequently, Type A behaviour is motivated by the need to minimise uncertainty regarding these abilities (Yuen & Kuiper, 1992). To acquire the diagnostic information necessary for accurate appraisals, Type A's resort to exaggerated achievement striving, and aggressive and time urgent behaviour (Strube, 1988; Strube et al., 1986). As Type A's may fail to realise that they simply lack certain abilities, they may strive unnecessarily and consequently, subject themselves to considerable stress (Strube, 1988). Given that the period of recovery from CHD is characterised by substantial uncertainty, Type A CHD patients are particularly prone to these stress inducing activities. However, rehabilitation programmes do provide an arena wherein Type A's can acquire accurate information concerning their physical abilities. Rehabilitation programmes offer Type A CHD patients a regular opportunity to test their exercise performance and consequently, acquire information regarding ability (Naughton & Hellerstein, 1971). If exercise performance is seen as a means of achieving an accurate appraisal of ability, then Strube's concept of self-appraisal may act as an antecedent of exercise compliance among Type A CHD patients. While Strube's (1987) model fails to elucidate Type A's

underlying need to minimise uncertainty regarding ability, it does suggest that an aberrant style of self-appraisal is an antecedent of Type A behaviour. Therefore, self-appraisal is included as an antecedent in the revised model.

Within the context of cardiac rehabilitation, behaviour is further anteceded by the numerous stressors generated by CHD. An initial premise of the present research was, that while CHD is a manifestation of stress induced strain, it is also the source of subsequent stress and strain. This argument was supported by Study 3 which demonstrated that the anger-in and anger-out components of cardiac patients' behaviour, thought to be generated by stress, induced anxiety and depression. However, the present research failed to measure the number and intensity of stressors experienced. Therefore, it was unable to establish whether the stressors which characterise the recovery period are in fact both antecedents of Type A behaviour and directly related to subsequent strain. The model depicted in Figure 9.1 lists the stressors discussed in Chapter 2 which are likely to act as antecedents of achievement striving, impatience irritability, hostility, anger-in and anger-out and the frequency and duration of exercise compliance. It is likely that these stressors will also be directly related to strain. To determine whether a direct relationship exists between these stressors and both the Type A and compliance components and subsequent strain, future research should measure the frequency and intensity of CHD patients' exposure to specific stressors.

The Type A Components: Achievement Striving, Impatience Irritability, Hostility, Anger-in and Anger-out

Study 2 of the present research demonstrated that the Type A behaviour manifested by cardiac patients comprises achievement striving, impatience irritability, hostility, anger-in and anger-out. Study 3 demonstrated that each of these act independently and differentially on measures of psychological health and thus, can be divided into

benign and toxic categories. By reconciling all five dimensions in a single model of Type A behaviour, Study 1 overcame two of the primary limitations of past research, namely, the failure to include the highly toxic components of anger and hostility and the failure to examine the incidence and effects of the five components in a high risk sample.

With the use of the Type A Component Questionnaire developed and validated in the present research it is possible to measure the components independently and identify specific relationships between the components and strain. With the use of this questionnaire it will also be possible to establish whether each component gains from its relationship with the other components (Carver, 1989). In other words, the Type A Component Questionnaire makes it possible to determine whether synergies exist between components. The present findings demonstrate that measuring the components independently not only enhances understanding of the Type A construct, but also provides an opportunity for determining which of the components are necessary and important (Carver, 1989) in the prediction of prognosis. However, to continue to focus on these Type A behaviours to the exclusion of other potential psychological and behavioural risk factors is scientifically impermissible (Grossarth-Maticek & Eysenck, 1991). Research by Cramer (1991) suggests that the Type A correlates, trait neuroticism and psychological distress (i.e., neurotic symptoms) may predict CHD. So too may other correlates of Type A behaviour such as hyperalertness (Price, 1982), authoritarianism (Byrne et al., 1989), and extraversion (Eysenck & Fulker, 1983). Therefore, future research should explore the relevance and prevalence of other components associated with Type A behaviour and increased risk of a negative prognosis.

Study 1 of the present research failed to yield significant differences between the levels of strain of the experimental and control groups of CHD patients. However, it is in the possible causes of the non significant results that Study 1 makes a contribution to extant knowledge. First, these results emphasise the inadequacy of measuring compliance exclusively in terms of attendance (Rejeski et al., 1984; Sharkey, 1984). Second, they demonstrate that, in the short term, hard disease end points are an insufficiently sensitive measure of physiological strain and that future research needs to utilise a measure able to detect more subtle changes in physiological condition (Bethell & Mullee, 1990; Pisa et al., 1985). These issues were addressed in Study 3 by measuring the frequency and duration of exercise compliance in relation to a more sensitive index of cardiovascular condition, namely, maximal oxygen uptake. As this study showed that it is the duration measure of exercise compliance which is significantly related to maximal oxygen uptake, it is clear that research can no longer rely on attendance figures alone to examine the relationship between exercise and physiological condition.

Covariates

To limit the possibility of achieving spurious results, the present research controlled potentially confounding variables by including them in the model as covariates. The variables considered as possible covariates were age, sex, race, marital status, occupation and education. Of these, age and occupation were significantly related to the predictor variables and were included as covariates in the model tested in Study 3. Two additional variables which may impose a confounding effect, are pharmacological treatment and the genetic component of maximal oxygen uptake. Inclusion of these two variables as covariates was beyond the scope of the present research. Therefore, in the revised model, the list of covariates is extended to include

pharmacological treatment and the genetic component of maximal oxygen uptake.

Research indicates that a number of the drugs used in the treatment of CHD diminish the intensity of Type A behaviour (*cf.* Powell, 1987; Schneider et al., 1982). For example, the beta-blocking drugs prescribed for many CHD patients not only reduce the incidence of reinfarction by 25%, but also, reduce Type A behaviour (Abbott & Peters, 1988). As has been outlined in previous chapters, a heightened cardiovascular response to stress is believed to be the mechanism linking Type A behaviour to CHD. There is some evidence to suggest that beta-blockers might inhibit Type A's exaggerated cardiovascular response to stress (Haynes & Matthews, 1988). The influence of beta-blockers on Type A assessment may also render Type A classifications invalid (Matthews, 1988). Thus, given its relationship to Type A behaviour, pharmacological treatment constitutes a potential covariate (Hartely et al., 1987. A variable likely to be related to exercise compliance, and consequently maximal oxygen uptake, is genetic predisposition. Sibling and twin studies show that as much as 38% of maximal oxygen uptake is genetically determined (Bouchard, Boulay, Simoneau, & Pèrusse, 1988). This explains why CHD patients' responses to training differ so greatly. By including approximately 40% of the variance in maximal oxygen uptake as a covariate, future research would be better able to identify the cause of the remaining variance in maximal oxygen uptake(Sandvik et al., 1993). The list of covariates included in the revised model is by no means exhaustive and should be extended or condensed according to the specific characteristics of the samples examined by future research.

Moderator Variables

Friedman and Booth-Kewley (1988) suggest that the modest size of the Type A-CHD relationship revealed in their meta-analysis may be the result of past research's failure to examine relevant moderating variables. Critical to the development of a

model for use in future research on CHD patients is an understanding of the factors which moderate the relationship between Type A and compliance behaviour and CHD (Powell, 1987). The present research indicates that, despite experiencing considerable stress, cardiac patients do not demonstrate significant levels of strain. As it is probable that situational and personality factors serve to develop resilience to stress, and consequently, modify strain (Ganellen & Blaney, 1984; Kobasa, Maddi & Courington, 1981), provision is made in the revised model for moderating variables. In interactive models, such as the one proposed here, the inclusion of moderating variables serves to increase the percentage of explained variance (Moosebrugger & Schermelleh-Engel, 1991).

Social Support

A variable likely to moderate the relationship between cardiac patients' stress and strain is social support (Orth-Gomér & Undén, 1990). The constant tension generated by Type A's impatience and hostility damages personal relationships to the extent that Type A's are prone to relatively unsupportive social networks (Abbott & Peters, 1988). The resulting social isolation is believed to contribute to physical morbidity and early mortality (Christensen & Smith, 1993). Indeed, several studies have revealed a significant relationship between the quantity and quality of social support and CHD morbidity and mortality (Abbott & Peters, 1988; Friedman & Booth-Kewley, 1987a; Lepore et al., 1993; Orth-Gomér & Undén, 1990). It is thought that, by protecting the individual from the pathological effects of extreme cardiovascular reactivity, social support reduces the impact of stress on the cardiovascular system (Lepore et al., 1993). A number of studies have demonstrated that social support reduces cardiovascular reactivity (e.g., Gerin, Pieper, Levy, & Pickering, 1992; Kamarck, Manuck & Jennings, 1990; Lepore et al., 1993). Therefore, it is possible that social support modifies CHD risk.

The individual's level of comfort with social support may also exert a moderating effect on exercise compliance, and consequently, physiological condition. Cardiac rehabilitation programmes are typically based on group activities, characterised by considerable social interaction and support (Blumenthal et al., 1982). For the socially extroverted individual comfortable with this milieu, support is likely to act as both a buffer against stress and as an inspiration to persist with healthy life-style changes (Rodin & Salovey, 1989). Comfort with social situations has been found to relate to compliance with a cardiac rehabilitation programme (Blumenthal et al., 1982). However, for the socially introverted patient, the supportive and interactive rehabilitation environment is likely to be so stressful as to cause these patients to withdraw from the programme (Blumenthal et al., 1982). Encouraging social introverts to remain in the programme may prove futile, as stress alters the physiological responses associated with exercise to the extent that it undermines the cardiovascular benefit of exercise (Roth et al., 1990).

Social support is also believed to moderate the relationship between stress and psychological strain (Bolger & Eckenrode, 1991). Rook (1987) asserts that social relationships not only render support with problems, but also provide a valuable source of companionship in the form of shared activities. Rook's (1987) research into this phenomenon reveals that the companionship derived from shared activities enhances psychological well-being and buffers the psychological impact of stress.

It may be that social support also exerts a negative moderating effect. Underlying social support is the norm of reciprocity wherein those rendering support will expect to receive a return for their efforts (Gouldner, 1960). According to Johnson and Morse (1990), CHD patients are often unable to reciprocate in a manner they would consider appropriate. The resulting sense of imbalance and indebtedness hinders patients' ability to participate fully in social relationships (Johnson & Morse, 1990). In this context, social support is likely to exacerbate the experience of stress and

strain. Clearly, social support has the potential to moderate the relationship between CHD patients' stress and strain either positively or negatively.

Locus of Control

A second moderator variable included in the revised model is locus of control. Type A's are believed to posses an internal locus of control (Ganster et al., 1991; Perloff, Yarnold, & Feltzer, 1988). An internal locus of control reflects a belief that the achievement of satisfaction is under the individual's personal control (Newton & Keenan, 1990) and protects the individual from the effects of stress (Kobasa, Maddi, & Zola, 1983). Individuals who are internally oriented tend to utilise adaptive health responses in terms of preventative and rehabilitative measures (Taylor & Cooper, 1988). Thus, internally oriented Type A's are likely to approach rehabilitation with the intention of controlling and hence facilitating their own process of recovery. Research shows that CHD patients who are internally oriented cope better with the process of adaptation than externally oriented patients (Terry, 1992). However, an internal locus of control is also positively associated with cardiovascular reactivity (Houston, 1986). It is possible that, while an internal locus of control increases resistance to stress, the act of imposing that control generates physiological responses which may culminate in strain. Thus, it is probable that locus of control will moderate the relationship between Type A behaviours and strain.

Perception of Health

A third moderator included in the model is the perception of health, be it optimistic or pessimistic. CHD patients' perception of their disease effects their reactions to symptoms and feelings of vulnerability (Martin & Lee, 1992). Patients' perception of their illness plays an important role in the process of adaptation to CHD (Desharnais et al., 1990). Maeland and Havick (1987) report a better rate of recovery

among patients who demonstrated a positive perception of their health and future functioning and few inaccurate beliefs concerning the limitations imposed by CHD. In comparison to pessimists, optimists have been found to enjoy a faster rate of recovery from a coronary artery bypass graft (Scheier et al., 1989), be more resistant to depression (Carver & Gaines, 1987) and to adopt more problem focused methods of coping (Scheier, Weintraub, & Carver, 1989). Therefore, it is likely that patients' optimistic or pessimistic perceptions of their health will moderate the process of recovery.

Outcome Variables

Anxiety, Depression and Mixed Anxiety-Depressive Disorder

The present research examined the impact of the psychological and behavioural predictors on anxiety, depression and maximal oxygen uptake. In the third study of this research, anger-out predicted less reduction in anxiety while both anger-in and anger-out predicted less reduction in depression. Contrary to expectations, impatience irritability and hostility were not associated with anxiety or depression. The duration of exercise also predicted less reduction in anxiety but was not associated positively with depression. Further, the frequency of exercise was related to neither anxiety nor depression. The results of past research suggest that a significant relationship between exercise and a reduction in these disorders largely occurs among patients diagnosed as clinically anxious or depressed (De Geus et al., 1993). Thus, the non significant relationship can be attributed to the fact that the present sample were not severely anxious or depressed. Given that the experience of anxiety and depression is pervasive among CHD patients (Brown & Munford, 1984; Hackett & Cassem, 1975), they are retained as measures of strain in the revised model. However, it is asserted that the conceptualisation and measurement of

anxiety and depression should be adapted to suit the psychological status of the sample.

Studies utilising samples characterised by low anxiety and depression at the inception of the research should accommodate the new diagnostic category included in the DSM-IV, namely, mixed anxiety-depressive disorder (American Psychiatric Association, 1994). The conceptual overlap between anxiety and depression translates to an average correlation of .61 between scales measuring the two disorders and a shared variance ranging between 37% and 48% (Endler & Parker, 1990; Gershon et al., 1991; Gotlib, 1984). Anxiety and depression are now viewed as coexisting parts of a general psychological distress state or response to stress (Endler & Parker, 1990). Symptoms of anxiety and depression frequently coexist in CHD populations (Gershon et al., 1992). Further, the two disorders only become distinct from one another as the severity and intensity thereof increases (Gershon et al., 1992). As the present research shows, the anxiety and depression manifested by CHD patients is not severe. A scale designed to measure the less severe category of mixed anxiety-depressive disorder could have important implications for assessing the strain experienced by CHD patients. With the application of such a scale it would be possible to determine whether the less severe form of mixed anxiety-depressive disorder is a pervasive disorder and whether, given sufficiently stressful conditions, can develop into more severe anxiety and depression (Gershon et al., 1991). By including anxiety and depression as both independent and combined measures of strain, the revised model makes provision for samples demonstrating varying degrees of these disorders. It also provides future research with the opportunity of comparing the utility of the two approaches to the measurement of anxiety and depression.

Maximal Oxygen Uptake and Coronary Artery Angiography

The relevance of maximal oxygen uptake as a measure of physiological outcome was supported by the present research which revealed a significant predictive relationship between the duration of exercise compliance and increased maximal oxygen uptake. However, contrary to expectations, the third study of the present research failed to reveal any relationships between the Type A components, exercise frequency and maximal oxygen uptake. One possible explanation for this is that while maximal oxygen uptake is a more sensitive measure of cardiovascular condition than hard disease end points, it may still be relatively insensitive to subtle changes in the further development of atherosclerosis. A coronary artery angiography provides the most precise measure of the extent of atherosclerotic build-up (Miller et al., 1991) and a reliable means of predicting subsequent CHD (Loscalzo, 1990). Unlike maximal oxygen uptake it is not a functional assessment and therefore does not provide information concerning changes in cardiorespiratory fitness (Schneiderman, Weiss, & Kaufman, 1989). Therefore, in the interests of greater precision, future research should measure outcome in terms of both angiographic reports and maximal oxygen uptake. By employing the measures in tandem, future research will be able to determine changes in both the extent of atherosclerosis and in levels of cardiorespiratory fitness with considerable accuracy.

Achievement of Control

The revised model includes achievement of control as a measure of recovery. To date the majority of cardiac rehabilitation studies have considered recovery in terms of return to work (e.g., Greenland & Briody, 1984; Smith & O'Rourke, 1988; World

Health Organization, 1981). These goals may not be consistent with the goals set by the patient mselves. Research implies that CHD patients' primary goal in the adjustment process is to regain control of their bodies and their lives (Johnson & Morse, 1990). The belief that control has been achieved enhances the ability to manage stress and cope with difficult and distressing circumstances (Ben-Sira, 1983). Conversely, the belief that control is evasive results in the abandonment of the battle to adjust and the acceptance of a permanent role as an invalid (Johnson & Morse, 1990). Therefore, future research should include a measure of recovery which is relevant to CHD patients, namely, the achievement of control.

Other Diseases

The interface between personality and disease has been studied widely and it is generally accepted that numerous illnesses have substantial psychological components (Carmody, Crossen, & Wiens, 1989). However, it is the relationship between Type A behaviour and CHD which has drawn researchers' attention (Rimé et al., 1989). As a consequence little attempt has been made to determine whether Type A behaviour predicts other diseases. As Type A behaviour generates a chronic state of stress, it is likely to predict other stress related diseases (Matteson & Ivancevich, 1980). For example, behavioural and personality components are implicated in the pathogenesis of cancer (Rodin & Salovey, 1989). Psychological factors, which include Type A behaviour among them have also been found to influence the development and progression of somatic illnesses such as skin disorders (Kaptein, 1990), asthma (Everaerd et al., 1990; Rimé et al., 1989), hypertension (Godaert, 1990), peptic ulcers, thyroid problems and rheumatoid arthritis (Rimé et al., 1989). While, the present research focused on the relationship between Type A behaviour and secondary CHD, it is possible that Type A behaviour

may be a general disease prone condition rather than a specific risk factor for CHD (Rimé et al., 1989). Therefore, it is important that future research consider the relationship between the construct and other diseases.

In sum, the revised model retains the original outcome variables of anxiety, depression and maximal oxygen uptake. To accommodate samples characterised by non-clinical anxiety and depression, the revised model suggests the measurement of the less severe outcome, Mixed anxiety-depressive disorder. In order for future research to determine the relationship between the predictor variables and subtle changes in atherosclerotic build-up, the revised model advocates the additional assessment of cardiovascular condition by means of coronary angiography. Also included is an outcome measure consistent with the goals set by CHD patients, namely the achievement of control. The revised model further suggests that Type A research should be extended beyond CHD, to examine the impact of the various components on other diseases.

Feedback Loops

In their conceptualisation of Type A behaviour, Friedman and Rosenman (1974) described the construct as a mode of response to environmental challenges to self-appraisal. While Type A behaviour was originally defined in terms of person-environment interactions, it has typically been studied as a personality trait (Thoreson & Powell, 1992). To restore Type A behaviour to its status as an interactional construct, it is necessary to examine the interdependent development and function of thoughts, perceptions, emotions, behaviours and physiological processes which occur in response to the environment over time (Thoreson & Powell,

1992). Thus, it is important that future research examines the reciprocal, as opposed to the linear, relationships between the various factors in the model. To accommodate this need, the revised model advocates the inclusion of a feedback loop between the antecedents and the outcome variables (Smith & Anderson, 1986). The inclusion of a feedback loop is motivated by the assertion that the way in which Type A's evaluate themselves and the extent to which they feel that their need for control is being fulfilled is influenced by how they perceive their physiological response to the cardiac event and their ability to cope with it (Bandura, 1982). Thus, Type A's positive or negative perception of their ability to adjust during the process of recovery will influence their future style of self-evaluation.

Conclusion

An aim of the present research was to reconcile components of Type A behaviour and exercise in a model of predictors of recovery from CHD. Since its identification in the 1950's the Type A construct has enjoyed erratic popularity. Following the significant results of the WCGS and Framingham study the construct was met with considerable enthusiasm. With the inconclusive and often negative results generated by subsequent studies, enthusiasm waned to the point of extreme scepticism (Thoreson & Powell, 1992). This led the proponents of Type A behaviour to investigate the multidimensional nature of the construct. These studies showed that the construct comprised both benign and toxic components each of which exerted a differential effect. The reconceptualisation and study of Type A behaviour as a multidimensional versus a global construct has rekindled enthusiasm to the extent that the concept of an independent relationship between psychological and behavioural constructs and health has achieved renewed credibility. Certainly, the

results of the present research support this revival. The present findings that achievement striving, impatience irritability, hostility anger-in and anger-out are differentially and independently related or unrelated to measures of health demonstrates that the term Type A behaviour may be, as suggested by Carver (1989), little more than a convenient summary of the various components which contribute to it. Despite these encouraging findings, it is recognised that the conceptualisation and measurement of Type A behaviour in the present research may not be sufficiently comprehensive or interactional to reduce the confusion surrounding the Type A construct.

Research into the prognostic role of aerobic exercise has been more consistent and numerous studies have demonstrated a relationship between exercise and reduced psychological strain and CHD risk (De Geus et al., 1990). While this relationship has been firmly established, little attempt has been made to look beyond the generic concept of exercise to determine the precise means by which exercise exerts such effects (Desharnais et al., 1993; Sharkey, 1984). By examining the components of exercise, and establishing that it is the duration of exercise which determines cardiovascular fitness, the present research contributes to an understanding of the mechanisms underlying the relationship between exercise and reduced CHD risk. It remains a task of future research to design studies able to identify the means by which exercise influences psychological strain.

To increase understanding of the predictive relationship between exercise and Type A components and the psychological and physiological strain of CHD patients, the present chapter proposes a transactional model of CHD patients' behaviour. The factors which trigger the model are the various CHD events and interventions. These

generate a number of stressors and cognitive antecedents, which in turn, motivate the achievement striving, impatience irritability, hostility, and anger expression thought to predict prognosis. Also included as predictors of prognosis are the frequency and duration of exercise compliance. Physiological prognosis is measured in terms of VO_2max and angiographic readings. Provision is also made in the model for the relationship between Type A behaviour and other diseases. Psychological outcomes in the revised model are anxiety and depression, mixed anxiety-depressive disorder and achievement of control. The relationship between the predictors and physiological and psychological outcomes is moderated by social support, locus of control and health perceptions. The revised model acknowledges the interdependent relationship between factors and provides for the impact of changes over time (Smith & Anderson, 1986). By testing this model it will be possible to establish which combinations of Type A and exercise compliance components increase the risk of persistent disease and which predict recovery. With this knowledge, it will be possible to design rehabilitation interventions which enhance health and reduce CHD risk through the modification of toxic, and cultivation of salutary, behaviours.

In conclusion, the present research has attempted to advance knowledge of the factors involved in the prediction of CHD patients' prognosis for psychological and physiological recovery. With respect to the role of exercise, the present research reveals that it is the duration of performance which influences cardiovascular condition. In so doing, it clarifies the means by which exercise exerts an influence on health. Given that the majority of extant studies have used the more convenient measure of exercise frequency, this finding may explain the equivocal results of past exercise research. The present research also answers the call for the recognition and study of Type A behaviour as a multidimensional construct (Thoreson & Powell, 1992). By defining CHD patients' Type A behaviour as comprising five, independent components, the present research reduces some of the ambiguity surrounding the construct. It also advances Type A component research by examining the differential impact of these components on CHD patients' psychological and cardiovascular health. The present research makes a further contribution to the theory and practice of Type A research through its development of a reliable and valid measure of CHD patients' Type A behaviour. While the present thesis may have contributed to existing knowledge, the work on the relationship between psychological and behavioural predictors of secondary CHD is far from complete. For, even when all classical and known psychosocial risk factors are considered, there remains a substantial amount of unaccounted for variance in the incidence of CHD (Chesney, 1993). Hence, there is a critical need to continue the search for variables which can be declared as indisputable risk factors of primary and secondary CHD.

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APPENDICES

APPENDIX A

Measuring Instruments used in the Present Research

The Illinois Personality Assessment Test Anxiety Scale

Inside this booklet you will find forty questions, dealing with difficulties that most people experience at one time or another. It will help a lot in self-understanding if you mark yes or, not etc., To each, frankly and truthfully, to describe any problems you may have. Never pass over an item but give an answer to every single one. Your answers will be entirely confidential. Do not spend time puzzling over them. Answer each one immediately, the way you want to at this moment (not last week, or usually). You may have answered questions like this before, but answer them as you feel now.

1	I find that my interests in people and amusements, tend to change fairly rapidly.	True ☐	In between ☐	False ☐
2	If people think poorly of me I can still go on quite happily and without worrying too much.	True ☐	In between ☐	False ☐
3	I like to wait till I am sure that what I am saying is correct, before I put forward an argument.	Yes ☐	In between ☐	No ☐
4	I am inclined to let my actions get influenced by feelings of jealousy.	Sometimes ☐	Seldom ☐	Never ☐
5	If I had my life to live over again I would: (A) plan very differently, (B) want it the same.	A ☐	In between ☐	B ☐
6	In general, I admire my parents.	Yes ☐	In between ☐	No ☐
7	I find it hard to "take 'no' for an answer", even when I know what I ask is impossible.	True ☐	In between ☐	False ☐
8	I doubt the honesty of people who are more friendly than I would naturally expect them to be.	True ☐	In between ☐	False ☐
9	In demanding and enforcing obedience my parents (or guardians) were: (A) always very reasonable, (B) often unreasonable.	A ☐	In between ☐	B ☐
10	I need my friends more than they seem to need me.	Rarely ☐	Sometimes ☐	Often ☐
11	I feel sure that I could "pull myself together" in an emergency.	Always ☐	Often ☐	Seldom ☐
12	As a child I was afraid of the dark.	Often ☐	Sometimes ☐	Never ☐
13	People sometimes tell me that I show my excitement in voice and manner too obviously.	Yes ☐	Uncertain ☐	No ☐
14	If people take advantage of my friendliness I: (A) soon forget and forgive, (B) resent it and hold it against them.	A ☐	In between ☐	B ☐
15	I find myself upset rather than helped by the kind of personal criticism that many people make.	Often ☐	Occasionally ☐	Never ☐
16	Often I get angry with people too quickly.	True ☐	In between ☐	False ☐
17	I feel restless as if I want something but do not know what.	Very Rarely ☐	Sometimes ☐	Often ☐
18	I sometimes doubt whether people I am talking to are really interested in what I am saying.	True ☐	In between ☐	False ☐
19	I have always been free from any vague feelings of ill-health, such as funny pains in my head, stomach or heart.	True ☐	Uncertain ☐	False ☐

20 In discussion with some people, I get so annoyed that I can hardly trust myself to speak.	Sometimes ☐	Rarely ☐	Never ☐
Through getting "worked-up" I use up more energy than most people in getting things done.	True ☐	Uncertain ☐	False ☐
ake a point of not being absent-minded etful.	True ☐	Uncertain ☐	False ☐
23 ver difficult and unpleasant the o les, I always stick to my original in s.	Yes ☐	In between ☐	No ☐
24 I get over-excited and "rattled" in ng situations.	Yes ☐	In between ☐	No ☐
25 sionally have vivid dreams that disturb eep.	Yes ☐	In between ☐	No ☐
26 I always have enough energy when faced with difficulties.	Yes ☐	In between ☐	No ☐
27 I sometimes find myself counting things for no apparent reason.	True ☐	Uncertain ☐	False ☐
28 Most people are a little queer mentally, though they do not like to admit it.	True ☐	Uncertain ☐	False ☐
29 If I make an awkward social mistake I soon forget it.	Yes ☐	In between ☐	No ☐
30 I feel grumpy and just do not want to see people: (A) occasionally, (B) rather often.	A ☐	In between ☐	B ☐
31 I am brought almost to tears by having things go wrong.	Never ☐	Very Rarely ☐	Sometimes ☐
32 In the midst of social groups I am nevertheless sometimes overcome by feelings of loneliness and worthlessness.	Yes ☐	In between ☐	No ☐
33 I wake in the night and, through worry, have some difficulty in sleeping again.	Often ☐	Sometimes ☐	Never ☐
34 My spirits generally stay high no matter how many troubles I meet.	Yes ☐	In between ☐	No ☐
35 I sometimes feel guilty or very sorry over quite small matters.	Yes ☐	In between ☐	No ☐
36 My nerves get on edge so that certain sounds, e.g. a screechy hinge, are unbearable and give me the shivers.	Often ☐	Sometimes ☐	Never ☐
37 If someone badly upsets me I generally calm down again quite quickly.	True ☐	Uncertain ☐	False ☐
38 I tend to tremble or perspire when I think of a difficult task ahead.	Yes ☐	In between ☐	No ☐
39 I usually fall asleep quickly, in a few minutes, when I go to bed.	Yes ☐	In between ☐	No ☐
40 I sometimes get very excited or "worked-up" as I think about things that have happened recently.	True ☐	Uncertain ☐	False ☐

The Beck Depression Inventory

Instructions to the Beck Depression Inventory

On this questionnaire are groups of statements. Please read each group of statements carefully. Then pick out the one statement in each group which best describes the way you have been feeling for the PAST WEEK, INCLUDING TODAY! Circle the number beside the statement you picked. If several statements in the group seem to apply equally well, circle each one. Be sure to read all the statements in each group before making your choice.

41	( )	0	I do not feel sad.
		1	I feel sad.
		2	I am sad all the time and I can't snap out of it.
		3	I am so sad or unhappy that I can't stand it.
42	( )	0	I am not particularly discouraged about the future.
		1	I feel discouraged about the future.
		2	I feel I have nothing to look forward to.
		3	I feel that the future is hopeless and that things cannot improve.
43	( )	0	I do not feel like a failure.
		1	I feel I have failed more than the average person.
		2	As I look back on my life, all I can see is a lot of failures.
		3	I feel I am a complete failure as a person.
44	( )	0	I get as much satisfaction out of things as I used to.
		1	I don't enjoy things the way I used to.
		2	I don't get real satisfaction out of things anymore.
		3	I am dissatisfied or bored with everything.
45	( )	0	I don't feel particularly guilty.
		1	I feel guilty a good part of the time
		2	I feel guilty most of the time
		3	I feel guilty all of the time
46	( )	0	I don't feel I am being punished.
		1	I feel I may be punished.
		2	I expect to be punished.
		3	I feel I am being punished.
47	( )	0	I don't feel disappointed in myself.
		1	I am disappointed in myself.
		2	I am disgusted with myself.
		3	I hate myself.
48	( )	0	I don't feel I am any worse than anybody else.
		1	I am critical of myself for my weaknesses or mistakes.
		2	I blame myself all the time for my faults.
		3	I blame myself for everything bad that happens.
49	( )	0	I don't have any thoughts of killing myself.
		1	I have thoughts of killing myself, but I would not carry them out.
		2	I would like to kill myself.
		3	I would kill myself if I had the chance.
50	( )	0	I don't cry anymore than usual.
		1	I cry more now than I used to.
		2	I cry all the time now.
		3	I used to be able to cry, but now I can't cry even though I want to.

51	( )	0	I am no more irritated now than I ever am.
		1	I get annoyed or irritated more easily than I used to.
		2	I feel irritated all the time now.
		3	I don't get irritated at all by the things that used to irritate me.
52	( )	0	I have not lost interest in other people.
		1	I am less interested in other people than I used to be.
		2	I have lost most of my interest in other people.
		3	I have lost all of my interest in other people.
53	( )	0	I make decisions about as well as I ever could.
		1	I put off making decisions more than I used to.
		2	I have greater difficulty in making decisions than before.
		3	I can't make decisions at all anymore.
54	( )	0	I don't feel I look any worse than I used to.
		1	I am worried that I am looking old or unattractive.
		2	I feel that there are permanent changes in my appearance that make me look unattractive.
		3	I believe that I look ugly.
55	( )	0	I can work about as well as before.
		1	It takes an extra effort to get started at doing something.
		2	I have to push myself very hard to do anything.
		3	I can't do any work at all.
56	( )	0	I can sleep as well as usual.
		1	I don't sleep as well as I Used to.
		2	I wake 1-2 hours earlier than usual and find it hard to get back to sleep.
		3	I wake up several hours earlier than I used to and cannot get back to sleep.
57	( )	0	I don't get more tired than usual.
		1	I get tired more easily than I used to.
		2	I get tired from doing almost anything.
		3	I am too tired to do anything.
58	( )	0	My appetite is no worse than usual.
		1	My appetite is not as good as it used to be.
		2	My appetite is much worse now.
		3	I have no appetite at all anymore.
59	( )	0	I haven't lost much weight, if any, lately.
		1	I have lost more than 5 pounds.
		2	I have lost more than 10 pounds.
		3	I have lost more than 15 pounds.
			I am purposefully trying to lose weight by eating less. Yes _____ No _____
60	( )	0	I am no more worried about my health than usual.
		1	I am worried about physical problems such as aches and pains; or upset stomach; or constipation.
		2	I am very worried about physical problems and it's hard to think of much else.
		3	I am so worried about my physical problems, that I cannot think about anything else.
61	( )	0	I have not noticed any recent change in my interest in sex.
		1	I am less interested in sex than I used to be.
		2	I am much less interested in sex now.
		3	I have lost interest in sex completely.

The Jenkins Activity Survey (Form N)

For each question choose the answer that is true for you, and circle the number to the right of the answer.

62 When you are under pressure or stress, do you usually

Do something about it immediately?	1
Plan carefully before taking any action?	2

63 When you listen to someone talking, and this person takes too long to come to the point, how often do you feel like hurrying the person along?

Frequently	1
Occasionally	2
Almost never	3

64 How often do you actually "put words in the person's mouth" in order to speed things up?

Frequently	1
Occasionally	2
Almost never	3

65 If you tell your spouse or a friend that you will meet somewhere at a definite time, how often do you arrive late?

Once in a while	1
Rarely	2
I am never late.	3

66 When you were younger, did most people consider you to be

Definitely hard-driving and competitive?	1
Probably hard-driving and competitive?	2
Probably more relaxed and easygoing?	3
Definitely relaxed and easygoing?	4

67 How would your spouse (or closest friend) rate you currently?

Definitely hard-driving and competitive?	1
Probably hard-driving and competitive?	2
Probably more relaxed and easygoing?	3
Definitely relaxed and easygoing?	4

68 How would your spouse (or closest friend) rate your general rate of activity?

Too slow. Should be more active.	1
About average. Is busy much of the time.	2
Too active. Needs to slow down.	3

69 How was your temper when you were younger?

Fiery and hard to control.	1
Strong, but controllable.	2
No problem.	3
I almost never got angry.	4

70 Would people you know well agree that you have less energy than most people?

Definitely yes.	1
Probably yes.	2
Probably no.	3
Definitely no.	4

71 When you are in a group, how often do people look to you for leadership?

Rarely.	1
About as often as they look to others.	2
More often than they look to others.	3

For each of the next questions compare yourself with the average person having the same kind of daily activities and life situation as you (e.g. similar occupation, family responsibilities, outside interests) and mark the most accurate description.

72 In being precise (careful about detail), I am

Much more precise.	1
A little more precise.	2
A little less precise.	3
Much less precise.	4

73 I approach life in general

Much more seriously.	1
A little more seriously.	2
A little less seriously.	3
Much less seriously.	4

74 When you were at high school, college, or university, did you play in any sports teams?

No.	1
Yes, one team.	2
Yes, two or more teams.	3

Anger Expression (AX) Scale

Directions: a number of statements which people have used to describe themselves when they feel angry or furious are given below. Read each statement and then darken the appropriate circle on the answer sheet to indicate how often you feel or act in the manner described. There are no right or wrong answers. Do not spend too much time on any one statement. For each item darken the circle which seems to best describe how you generally act or feel when you are angry or furious.

WHEN ANGRY OR FURIOUS.....	Almost Never	Some-times	Often	Almost Always
88 I express my anger	1	2	3	4
89 I keep things in	1	2	3	4
90 I pout or sulk	1	2	3	4
91 I withdraw from people	1	2	3	4
92 I make sarcastic remarks to others	1	2	3	4
93 I do things like slam doors	1	2	3	4
94 I boil inside, but I don't show it.	1	2	3	4
95 I argue with others	1	2	3	4
96 I tend to harbor grudges that I don't tell anyone about.	1	2	3	4
97 I strike out at whatever infuriates me	1	2	3	4
98 I am secretly quite critical of others	1	2	3	4
99 I am angrier than I am willing to admit	1	2	3	4
100 I say nasty things.	1	2	3	4
101 I am irritated a great deal more than people are aware of.	1	2	3	4
102 I lose my temper.	1	2	3	4
103 If someone annoys me, I am apt to tell him or her how I feel.	1	2	3	4

Acting-out hostility subscale of the Hostility and Direction of Hostility Questionnaire

Please fill in this form by putting a circle round the "true" or the "false" after each of the following statements. If you find it difficult to decide, ask yourself whether you think the statement is on the whole true or false and put a circle round the appropriate word.

75 I don't blame anyone for trying to grab everything he can get in this world.	T	F
76 I can easily make other people afraid of me, and sometimes do for the fun of it.	T	F
77 In school I was sometimes sent to the principle for misbehaving.	T	F
78 Sometimes I enjoy hurting persons I love.	T	F
79 Sometimes I feel as if I must injure either myself or someone else.	T	F
80 I sometimes tease animals.	T	F
81 I get angry sometimes.	T	F
82 At times I have a strong urge to do something harmful or shocking.	T	F
83 I am easily downed in an argument.	T	F
84 I easily become impatient with people.	T	F
85 I get angry easily and then get over it soon.	T	F
86 At times I feel like smashing things.	T	F
87 At times I feel like picking a fist fight with someone.	T	F

APPENDIX B

The Covering Letter, Letter of Informed Consent, Demographic Checklist and Open Ended Question Used in the First Study

City of Johannesburg

CITY HEALTH DEPARTMENT
Medical Officer of Health : Prof Hilliard S. Nurwitz

Your ref.
Our ref.
Refer to

Civic Centre
Braamfontein
Johannesburg

PO 1477
Johannesburg
2000

☎ 407-6111
Fax 403-1069

Dear Sir/Madam

The Johannesburg City Health Department Cardiac Rehabilitation Centre is currently conducting a research project in conjunction with members of the University of the Witwatersrand's School of Psychology. The aim of the project is to examine aspects of the rehabilitation process in cardiac patients. To achieve this objective we are examining the psychological and physical well being of cardiac patients. The role of the School of Psychology is to analyse and collate the data pertaining to the project. The collated data will be used by a postgraduate student for the purpose of a Masters degree.

Please would you assist us by completing the following questionnaire and returning it in the enclosed envelope as soon as possible. No member of the School of Psychology will have access to patient's records or names. I would further like to emphasise that your participation is voluntary and that your responses will be used for research purposes only.

In accordance with the stipulations set out by the ethics committees of the Johannesburg City Health Department and the University of the Witwatersrand, we are unable to release your anonymous data to the School of Psychology without your written consent. Should you decide to participate in the project, please complete the attached form of informed consent and return it with the questionnaire. Please note that you are free to withhold consent and such action will not effect your status at the unit.

Thank you for your time and cooperation.

Yours sincerely

A G Digenis

Ie brief sal in die ander amptelike taal aan u gestuur word indien u dit binne sewe dae na die briefdatum hierbo skriftelik versoek

SSIC5

City of Johannesburg

CITY HEALTH DEPARTMENT
Medical Officer of Health : Prof Hilliard S. Hurwitz

Your ref.
Our ref.
Refer to

Civic Centre
Braamfontein
Johannesburg

P.O. 1477
Johannesburg
2000

☎ 407-6111
Fax 403-1069

INFORMED CONSENT

PHYSICAL EXERCISE AS A MODERATOR OF THE TYPE A - STRAIN RELATIONSHIP IN CARDIAC REHABILITATION PATIENTS

I, _____ aged _____ years, consent to participate in the research project, concerning aspects of the cardiac rehabilitation process, conducted by the Johannesburg City Health Department Cardiac Rehabilitation Centre and members of the University of the Witwatersrand's School of Psychology.

I understand and appreciate that:

a. - by agreeing to participate, I consent to the release of information pertaining to my physiological and psychological status to members of the University of the Witwatersrand's School of Psychology.

b. - my name will not be released to the members of the University of the Witwatersrand's School of Psychology.

c. - the released information will remain confidential.

d. - participation is voluntary.

e. - the information will be used for research purposes only.

_____ _____
(Signature of participant) (Date)

Witness: _____
(Name)

_____ _____
(Signature of witness) (Date)

The Cardiac Rehabilitation Questionaire

The aim of this questionaire is to assess cardiac rehabilitation patient's physiological and psychological condition.In the following pages,you will find a number of statements with corresponding responses.Please mark the response which is closest to the way you feel.There are no right or wrong responses,so please answer the questions as honestly and accurately as possible.Confidentiality is guaranteed.You are not required to write your name anywhere on this questionaire,so your responses will remain anonymous.

PLEASE PROVIDE THE FOLLOWING BIOGRAPHICAL INFORMATION:

Present Occupation:_____
Age :_____
Sex :_____
Race :_____
Present weight :_____
Education :(please circle the appropriate response)

1.Std.VIII
2.Matric
3.Technical
4.Professional Qualification
5.University Degree
6.Post Graduate Degree

PLEASE TICK THE APPROPRIATE RESPONSES:

1.Have you experienced any of the following since your last medical check up at the Cardiac rehabilitation Centre:

a.Myocardial Infarction	Yes No
b.Coronary Artery bypass	Yes No
c.Angioplasty	Yes No
d.Coronary Artery Angiography	Yes No
e.Other Cardiac Surgery	Yes No
f.At present,do you have any physical complaints (e.g.chest pain,palpitations, shortness of breath,fatigue).	Yes No

g.If yes,please specify.

_____
_____
_____
_____

2.Since leaving the Cardiac rehabilitation Centre,have you smoked:

a.Cigarettes | Yes | No | Stopped |

Date started(year)_____
Date stopped(year,month,day)_____
No.of cigarettes smoked per day.(average)_____

b.A Pipe | Yes | No | Stopped |

Date started(year)_____
Date stopped(year,month,day)_____

c.Cigars | Yes | No | Stopped |

Date started(year)_____
Date stopped(year,month,day)_____
No.of cigars smoked per day(on average)_____

3a.Are you currently on treatment for Hypertension? Yes | No

b.How long have you been receiving treatment?_____

4a.Have you had your cholesterol level checked within the past six months? Yes | No

b.Were the results positive? Yes | No

5 Have you been diagnosed as having Diabetes Mollitus? Yes | No

6a.Have your parents or siblings ever experienced a coronary event? Yes | No

b.If yes,what was their relationship to you (e.g. Mother,father)_____

c.How old where they when the first event occured?_____

7a.Are you currently participating in any supervised exercise? Yes | No

b.Where?_____
c.Type of exercise?_____
d.How often do you attend?_____

In order to assess the effectiveness of the Cardiac Rehabilitation Centre's program,we would like you to indicate your reasons for leaving the Centre and any suggestions that you may have for how the program can be improved.The Cardiac Rehabilitation Centre will not be notified of your particular suggestions or reasons for leaving,but will be provided with a summary of all responses.

Reasons for leaving:

Suggestions:

APPENDIX C

The Type A Component Questionnaire

The Type A Component Questionnaire

For each question choose the answer that is true for you, and circle the number to the right of the answer.

1 When you listen to someone talking, and this person takes too long to come to the point, how often do you feel like hurrying the person along?

Frequently	1
Occasionally	2
Almost never	3

2 How often do you actually "put words in the person's mouth" in order to speed things up?

Frequently	1
Occasionally	2
Almost never	3

3 I easily become impatient with people. T F

4 When you were younger, did most people consider you to be

Definitely hard-driving and competitive?	1
Probably hard-driving and competitive?	2
Probably more relaxed and easygoing?	3
Definitely relaxed and easygoing?	4

5 How would your spouse (or closest friend) rate you currently?

Definitely hard-driving and competitive?	1
Probably hard-driving and competitive?	2
Probably more relaxed and easygoing?	3
Definitely relaxed and easygoing?	4

6 I approach life in general

Much more seriously.	1
A little more seriously.	2
A little less seriously.	3
Much less seriously.	4

7 How was your temper when you were younger?

Fiery and hard to control.	1
Strong, but controllable.	2
No problem.	3
I almost never got angry.	4

8 I can easily make other people afraid of me, and sometimes do for the fun of it. T F

9 Sometimes I enjoy hurting persons I love. T F

10 At times I have a strong urge to do something harmful or shocking. T F

11 I get angry easily and then get over it soon. T F

12 At times I feel like smashing things. T F

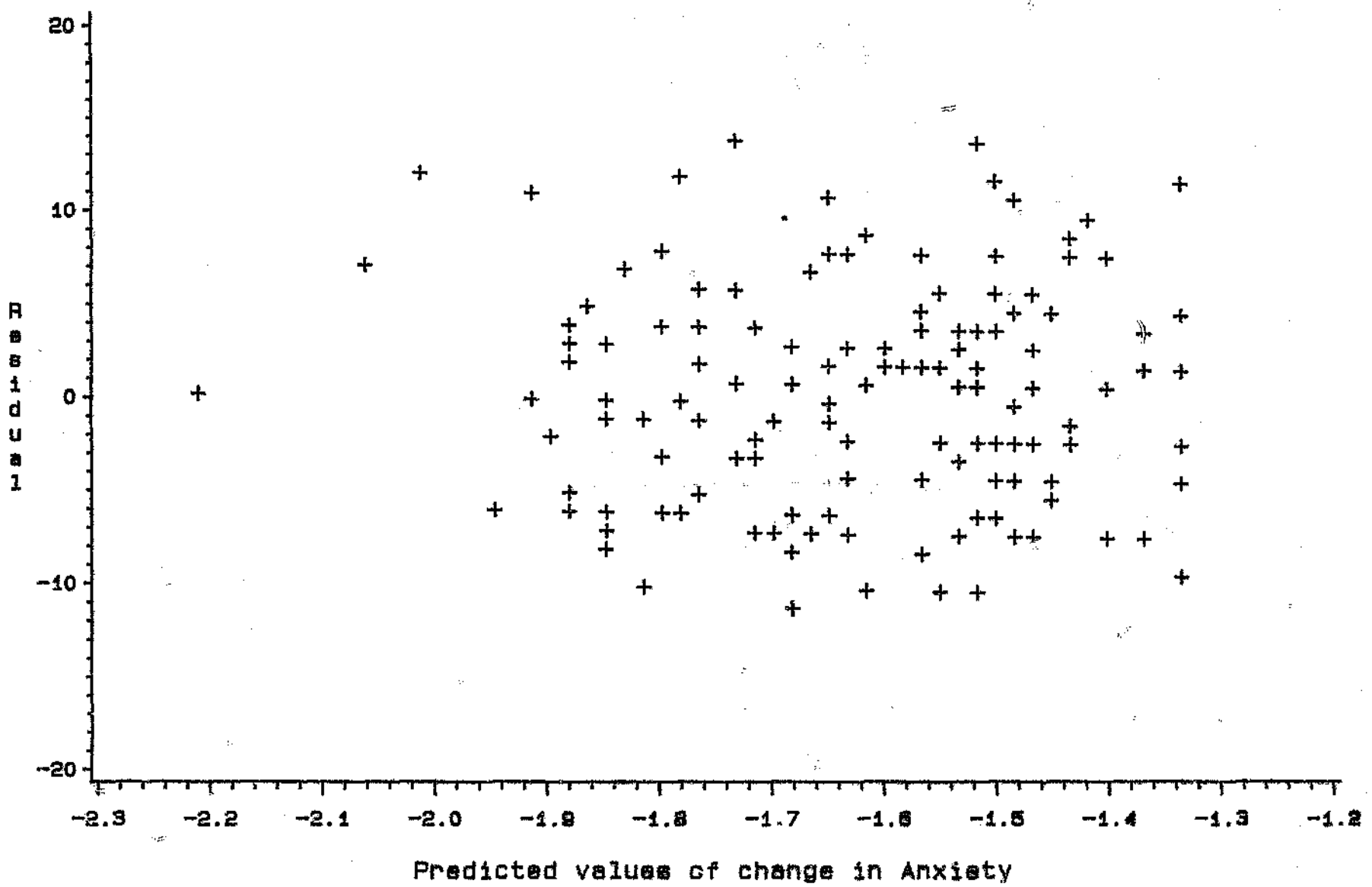
13 At times I feel like picking a fist fight with someone. T F

WHEN ANGRY OR FURIOUS.....	Almost Never	Some-times	Often	Almost Always
		2	3	4
14 I pout or sulk				
15 I withdraw from people	1	2	3	4
16 I boil inside, but I don't show it.	1	2	3	4
17 I tend to harbor grudges that I don't tell anyone about	1	2	3	4
18 I am angrier than I am willing to admit	1	2	3	4
19 I am irritated a great deal more than people are aware of.	1	2	3	4
20 I keep things in.	1	2	3	4
21 I express my anger	1	2	3	4
22 I argue with others	1	2	3	4
23 I strike out at whatever infuriates me	1	2	3	4
24 I say nasty things.	1	2	3	4
25 I lose my temper.	1	2	3	4
26 If someone annoys me, I am apt to tell him or her how I feel.	1	2	3	4

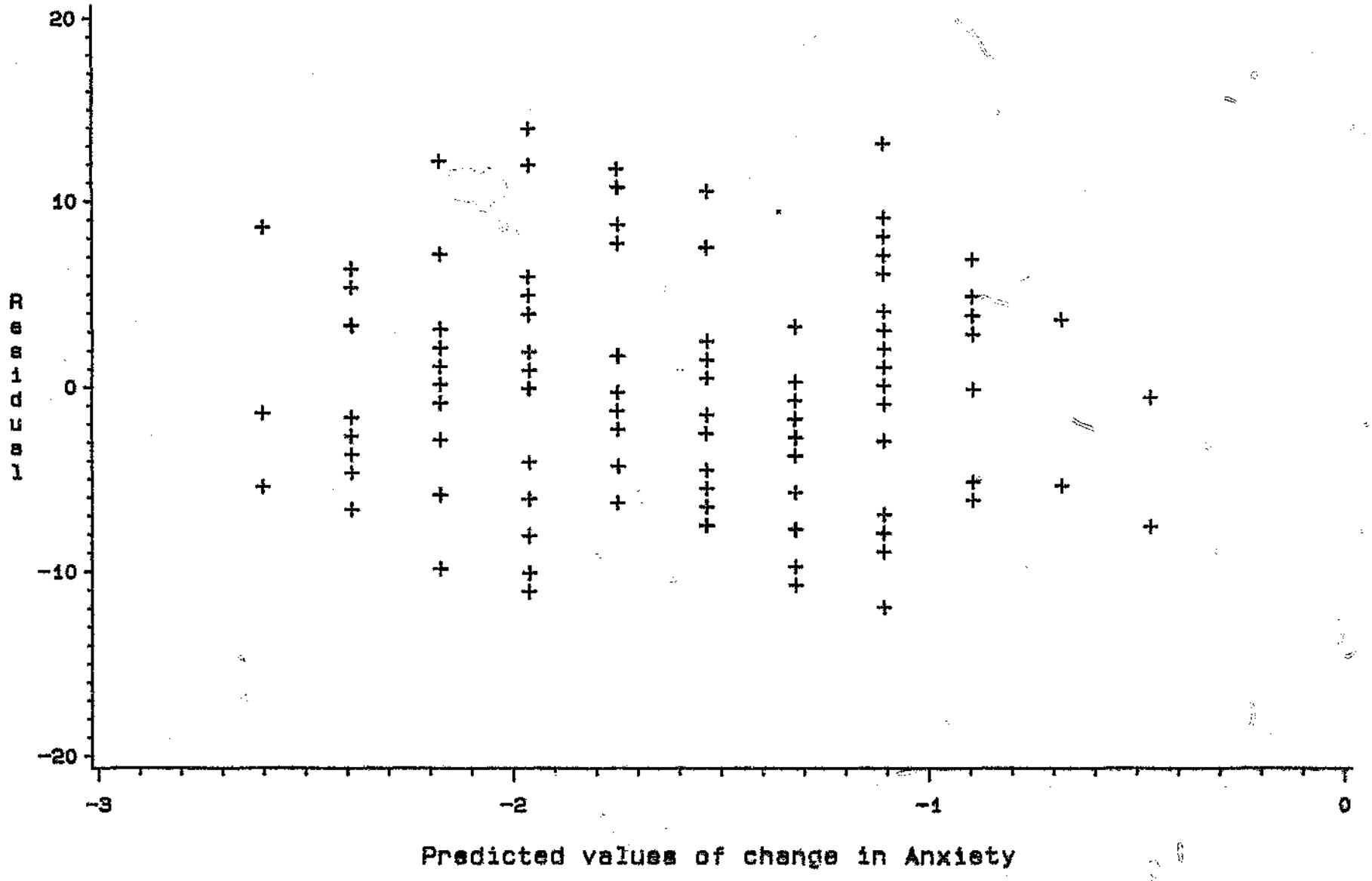
APPENDIX D

Residual Plots used for the Assumption Test of Linearity

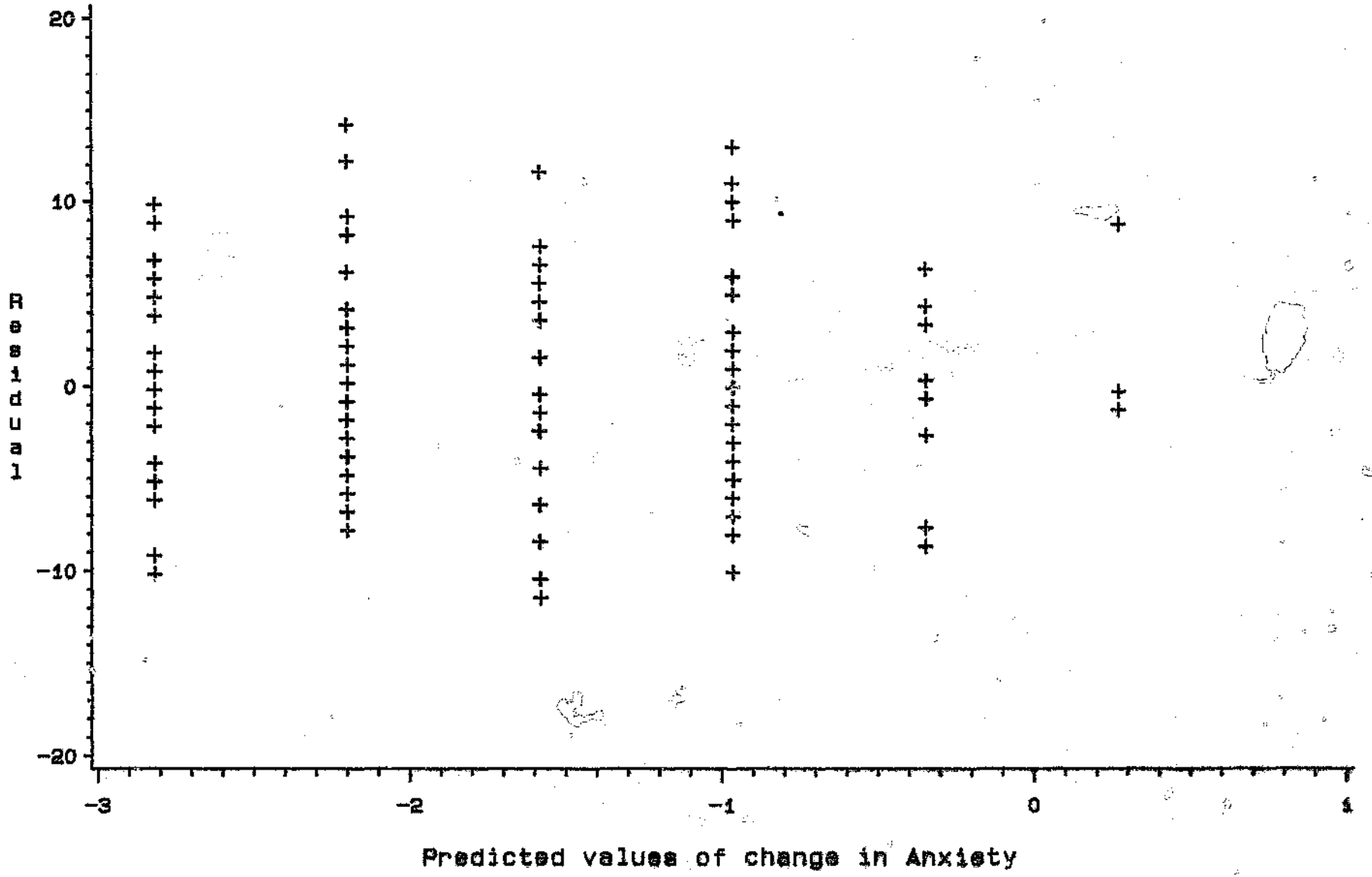
Age


20
10
0
-10
-20
Residual
-2.3
-2.2
-2.1
-2.0
-1.9
-1.8
-1.7
-1.6
-1.5
-1.4
-1.3
-1.2
Predicted values of change in Anxiety

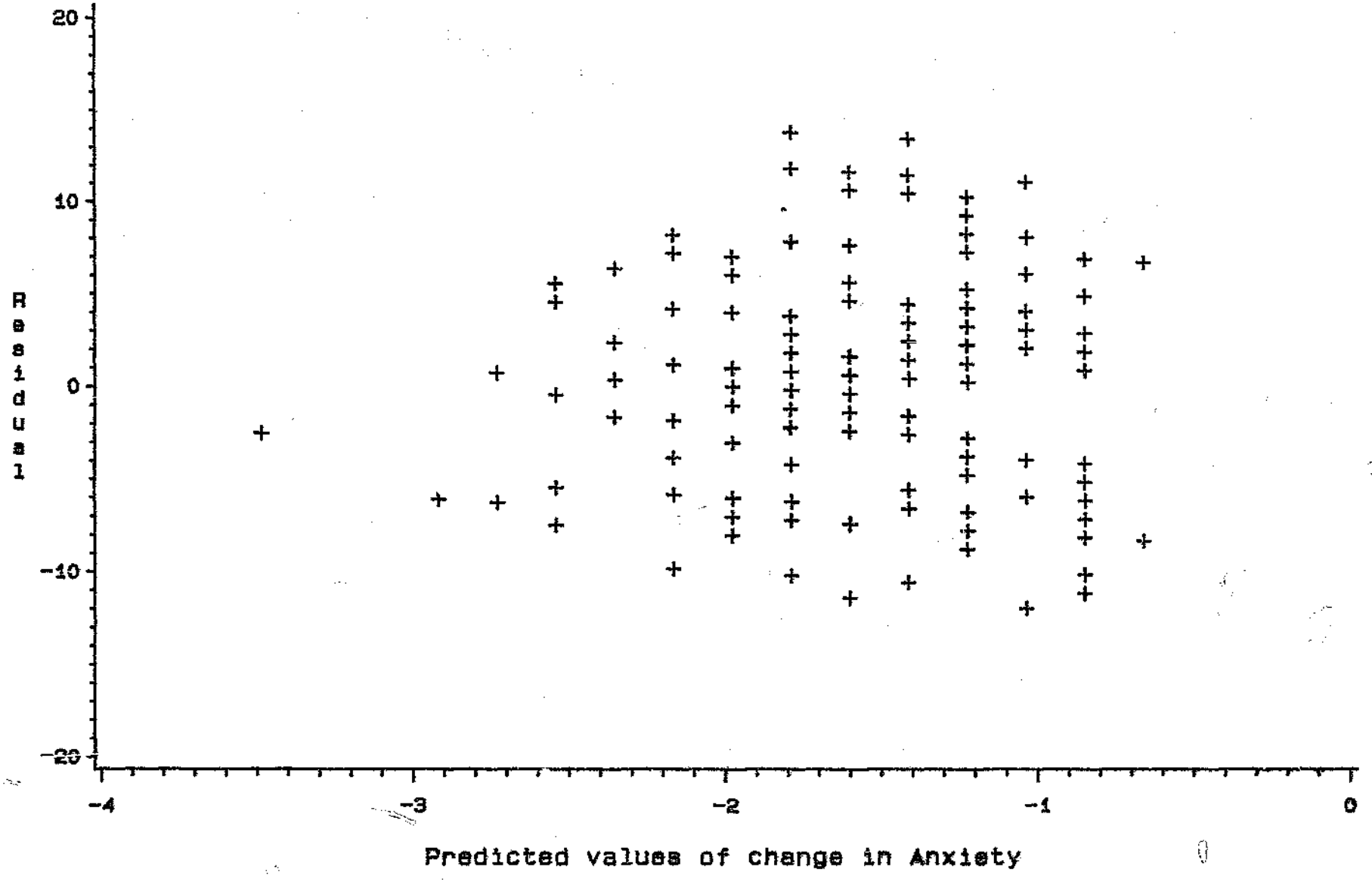
Achievement Striving



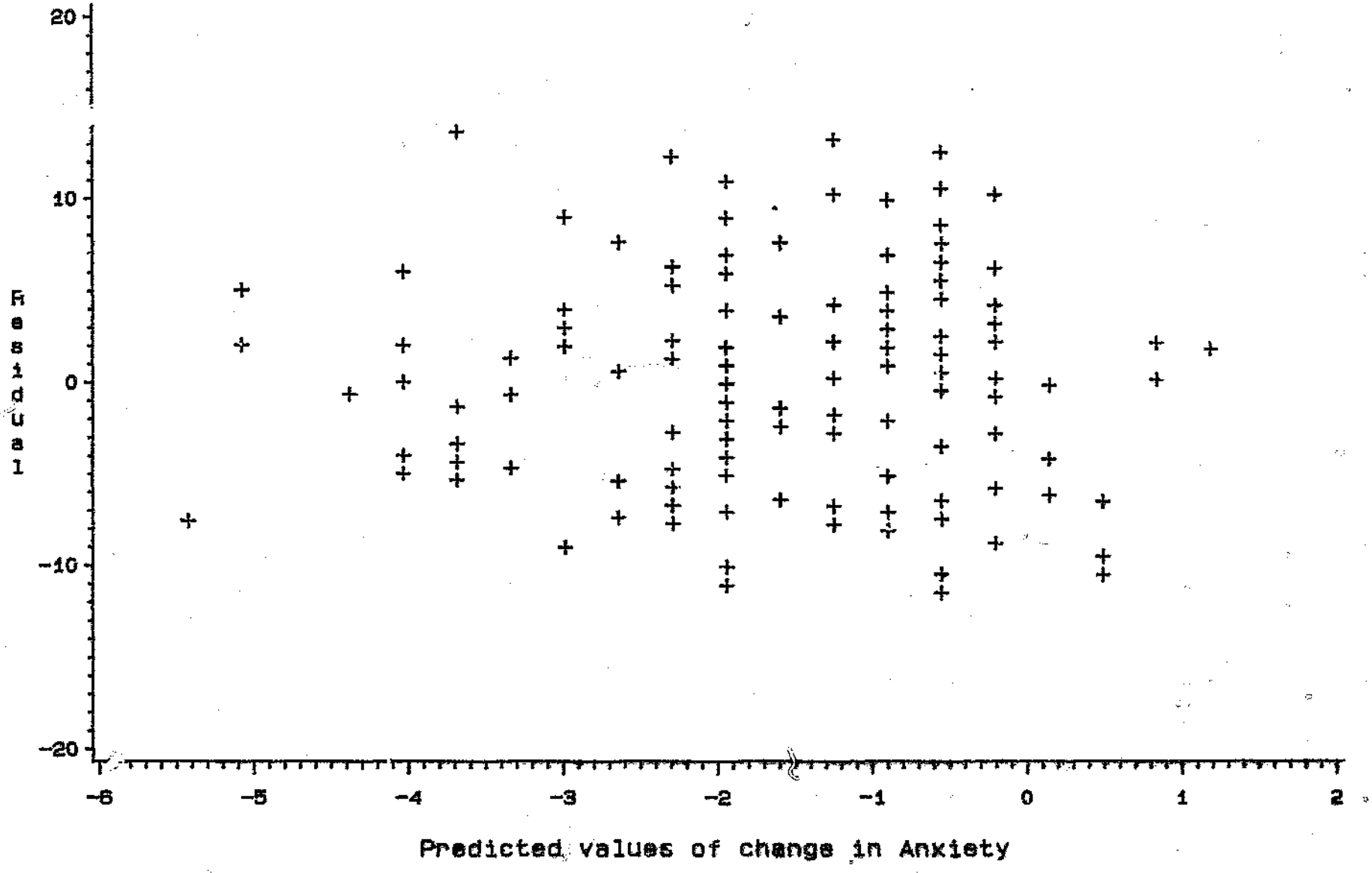
Impatience Irritability



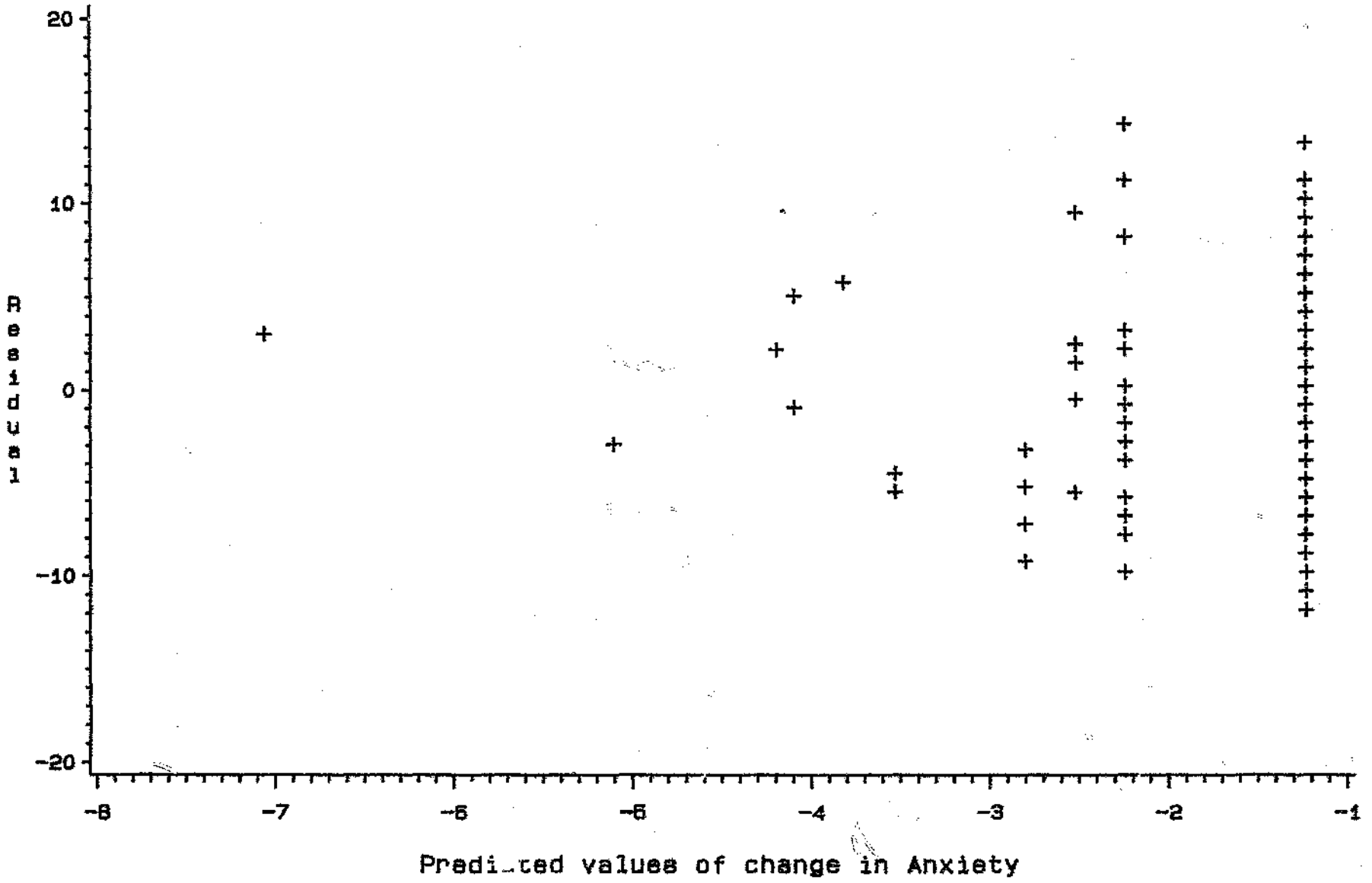
Anger – in


20
10
0
-10
-20
Residual
-4
-3
-2
-1
0
Predicted values of change in Anxiety

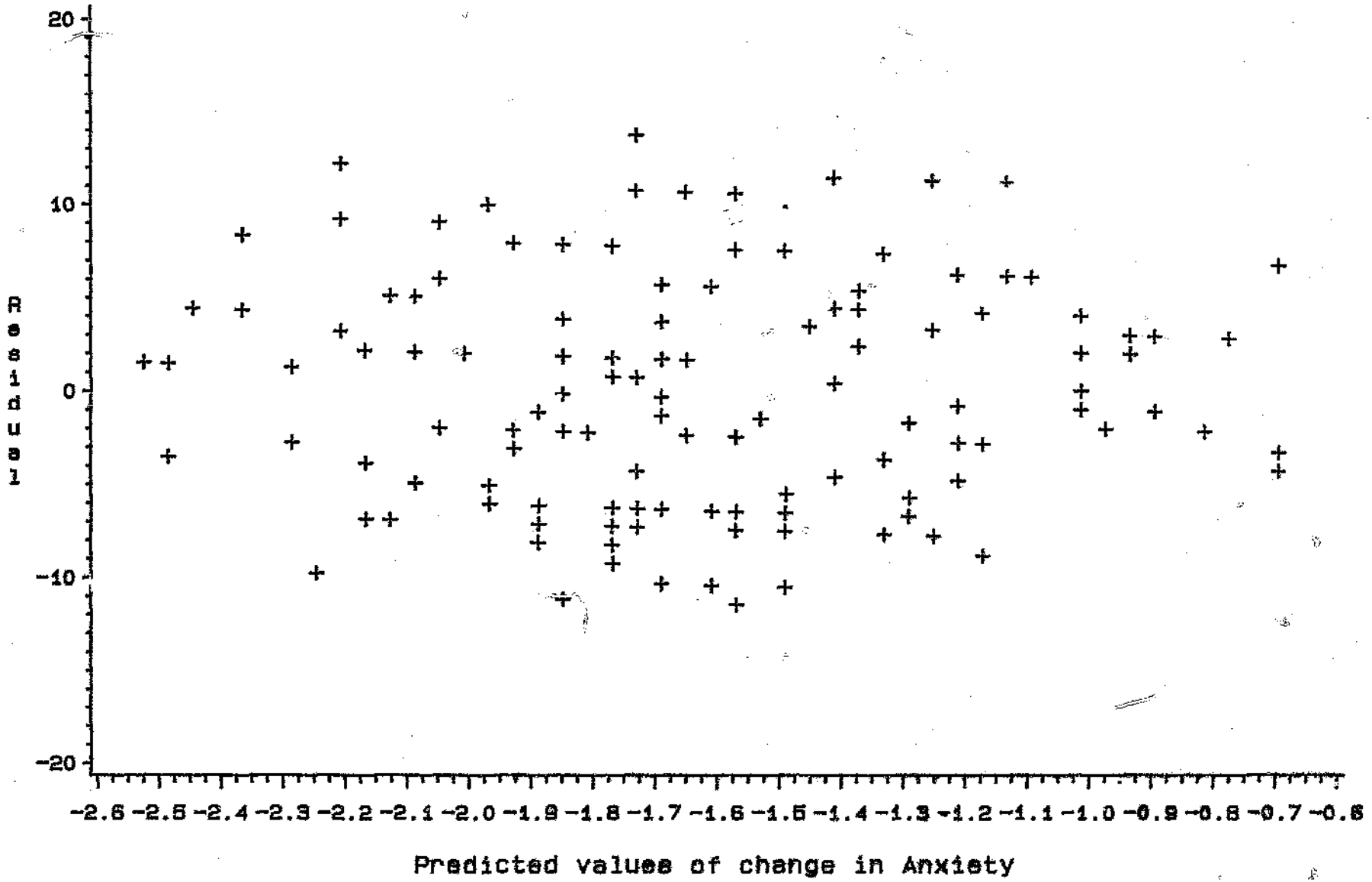
Anger – out


20
10
0
-10
-20
Residual
-6
-5
-4
-3
-2
-1
0
1
2
Predicted values of change in Anxiety

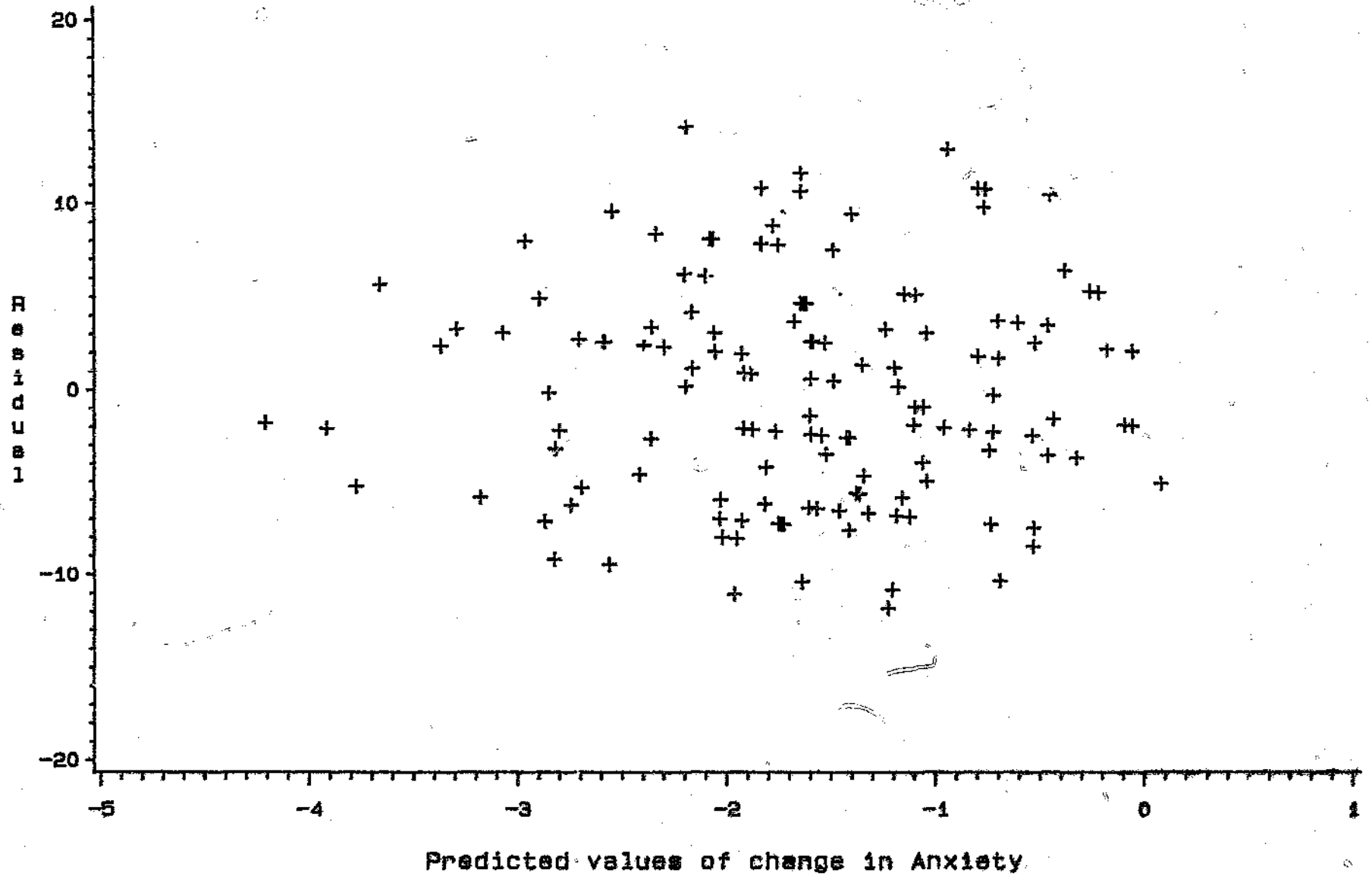
Hostility


20
10
0
-10
-20
Residual
-8
-7
-6
-5
-4
-3
-2
-1
Predicted values of change in Anxiety

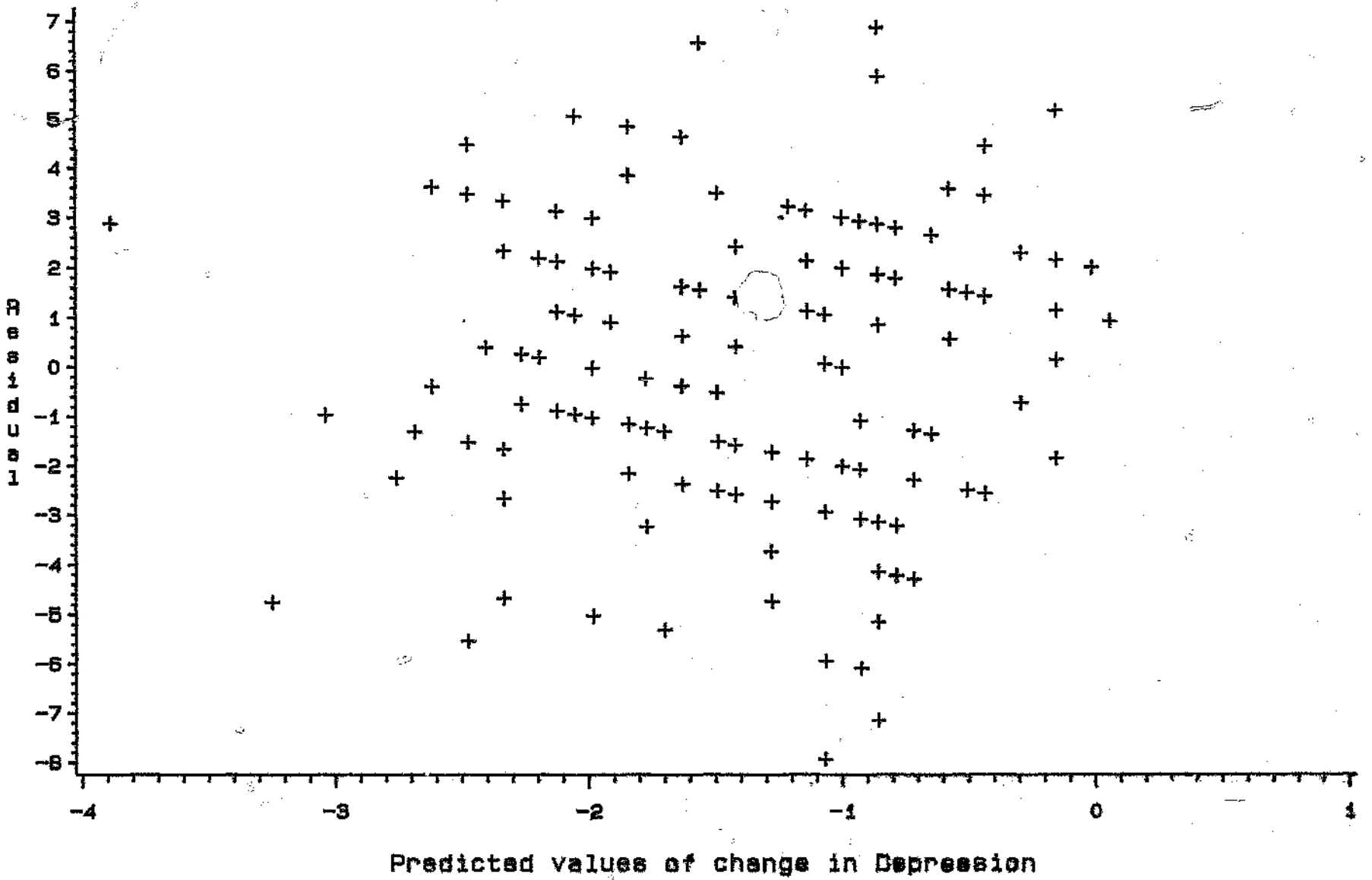
Frequency of Exercise



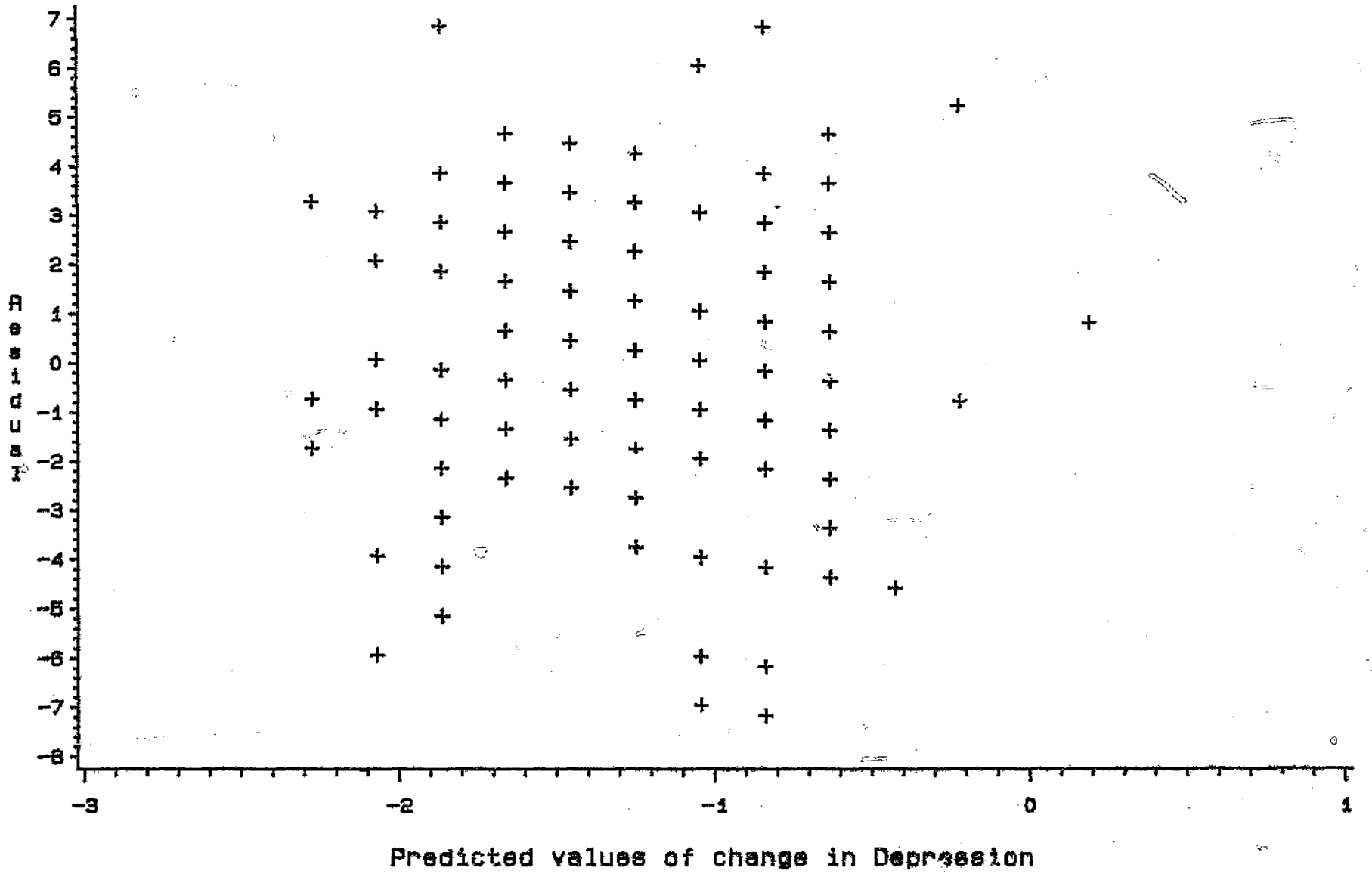
Duration of Exercise



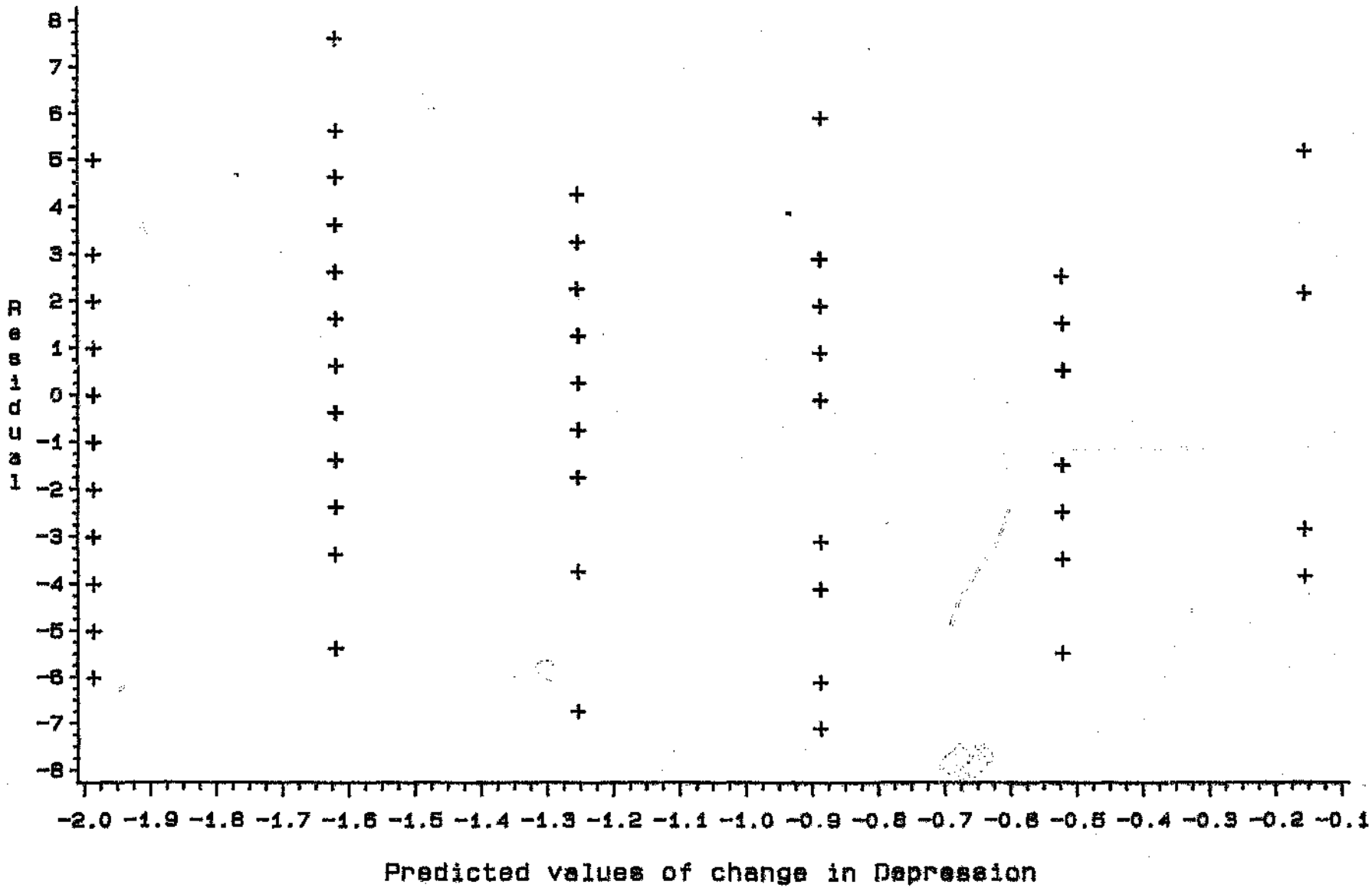
Age


Residual
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-4
-3
-2
-1
0
1
Predicted values of change in Depression

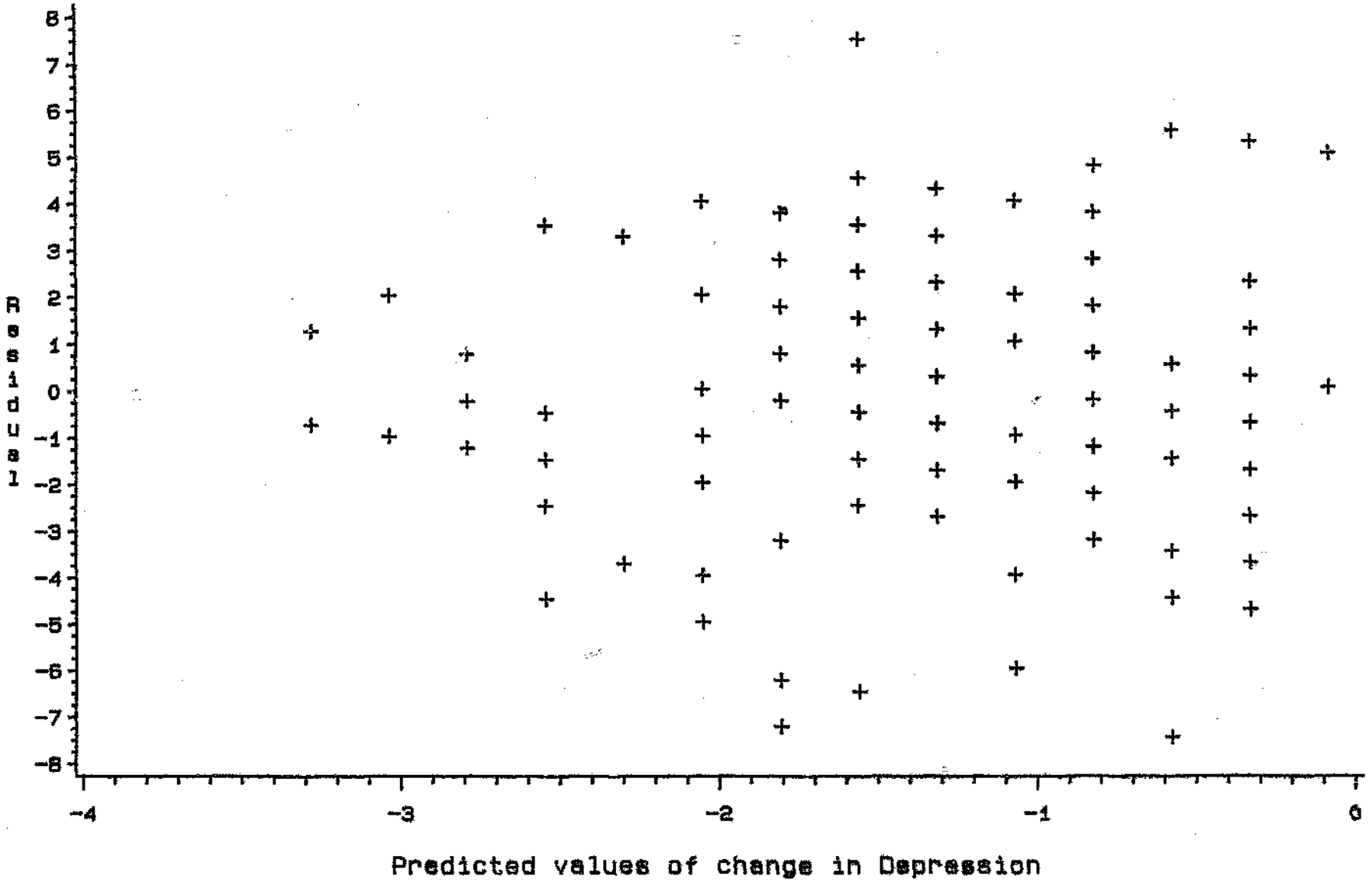
Achievement Striving



Impatience Irritability



Anger – In


Residual
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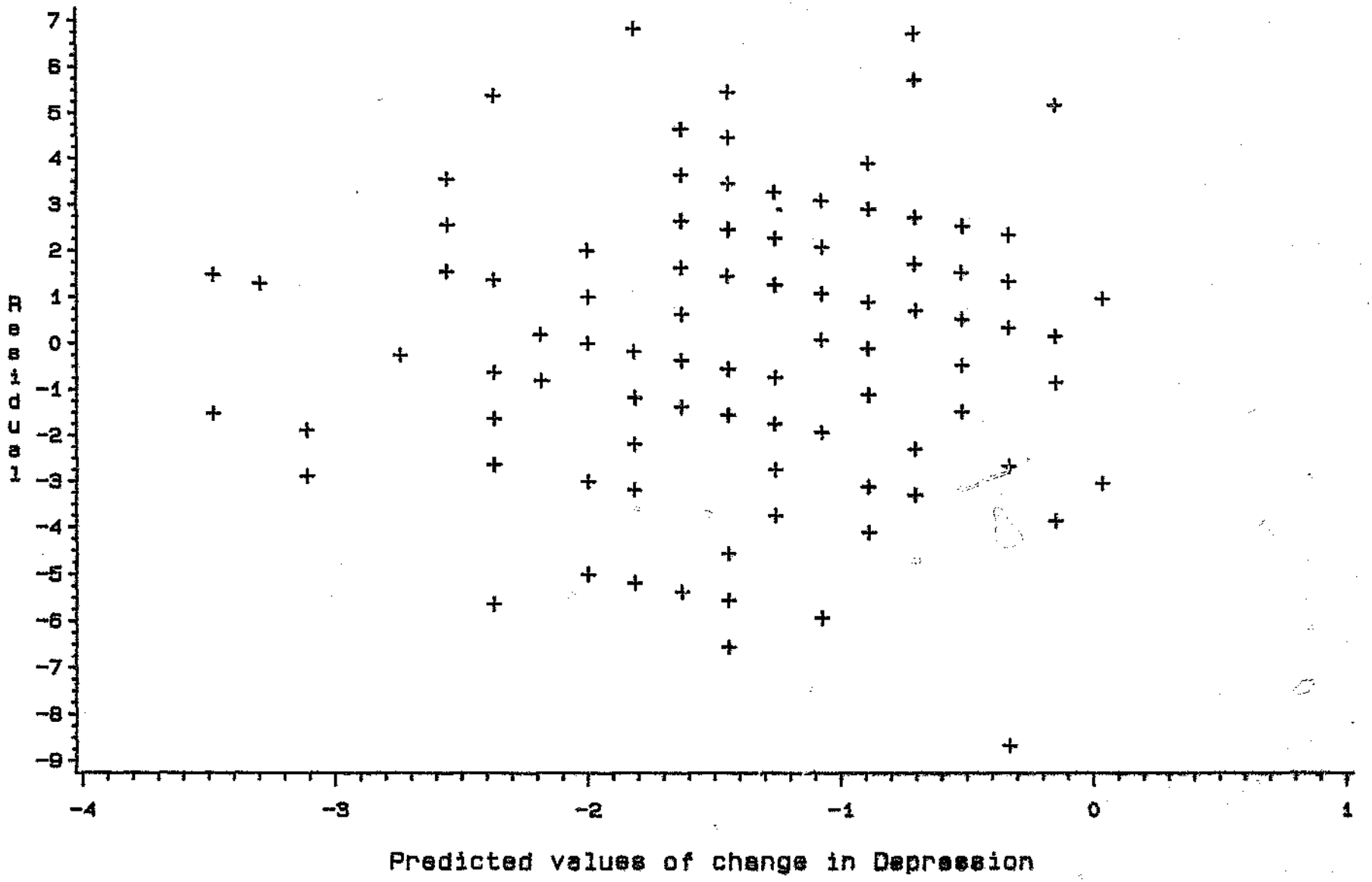
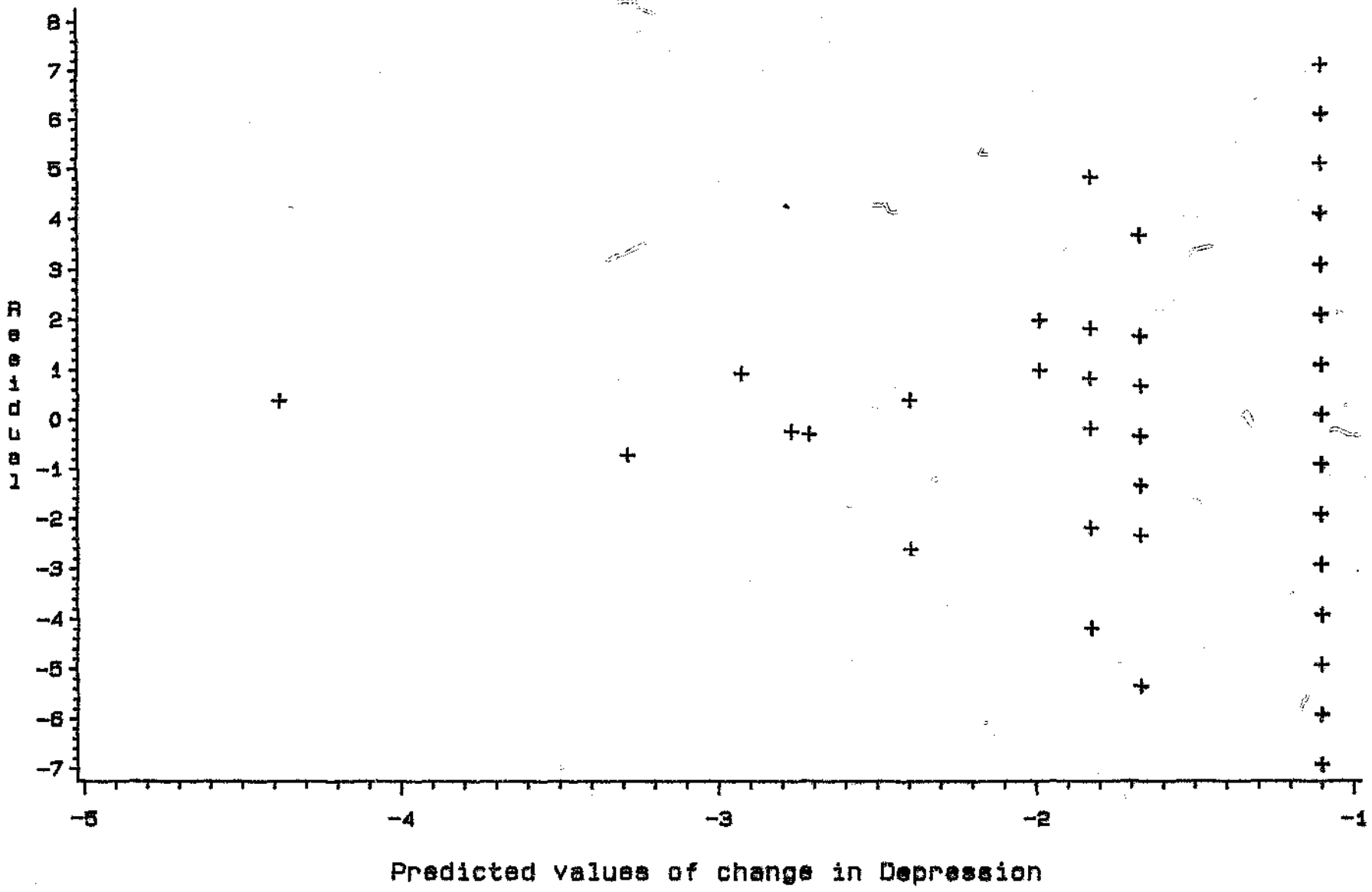
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-4
-3
-2
-1
0
Predicted values of change in Depression

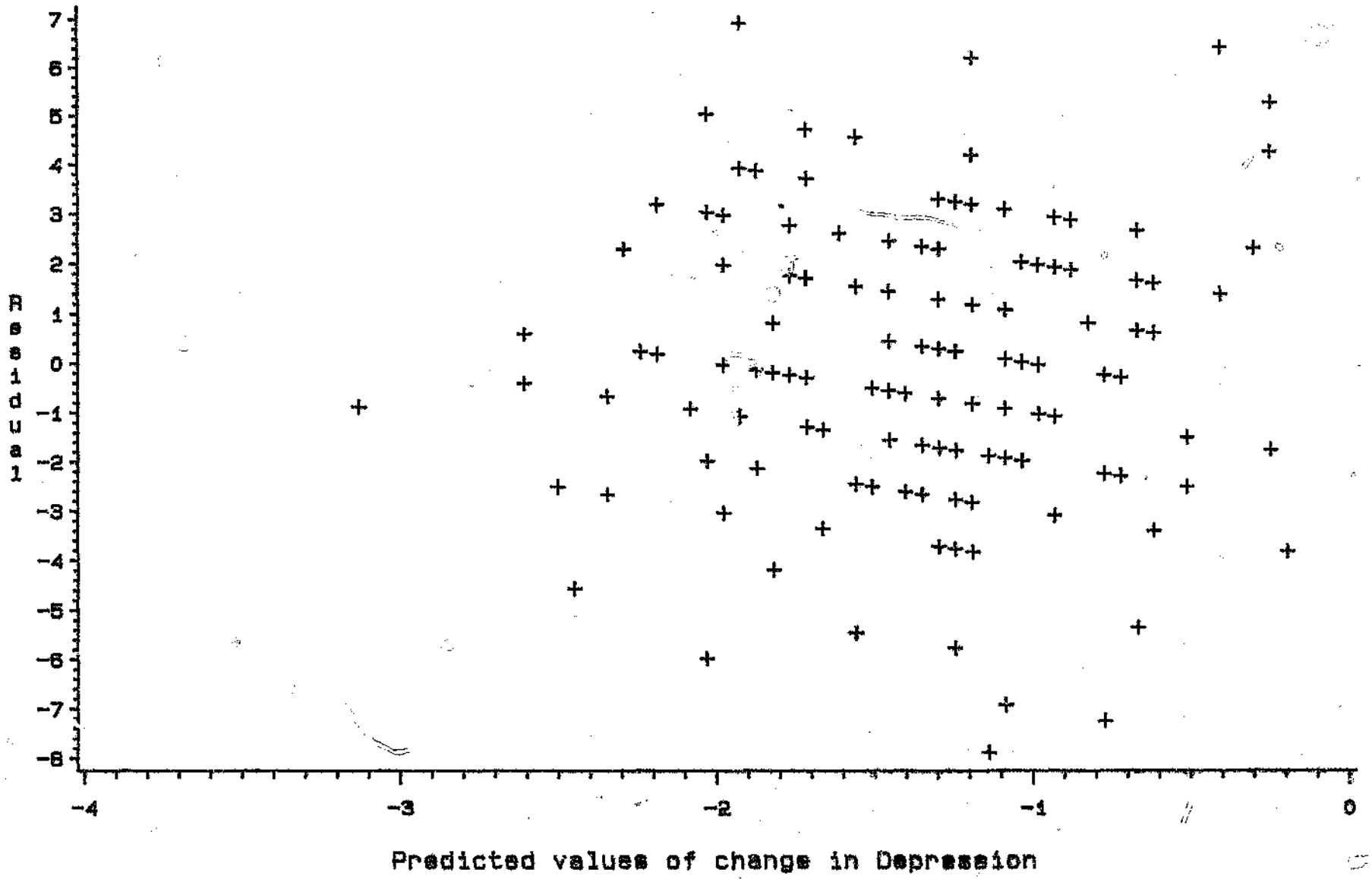
Anger – out


Residual
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-4
-3
-2
-1
0
1
Predicted values of change in Depression

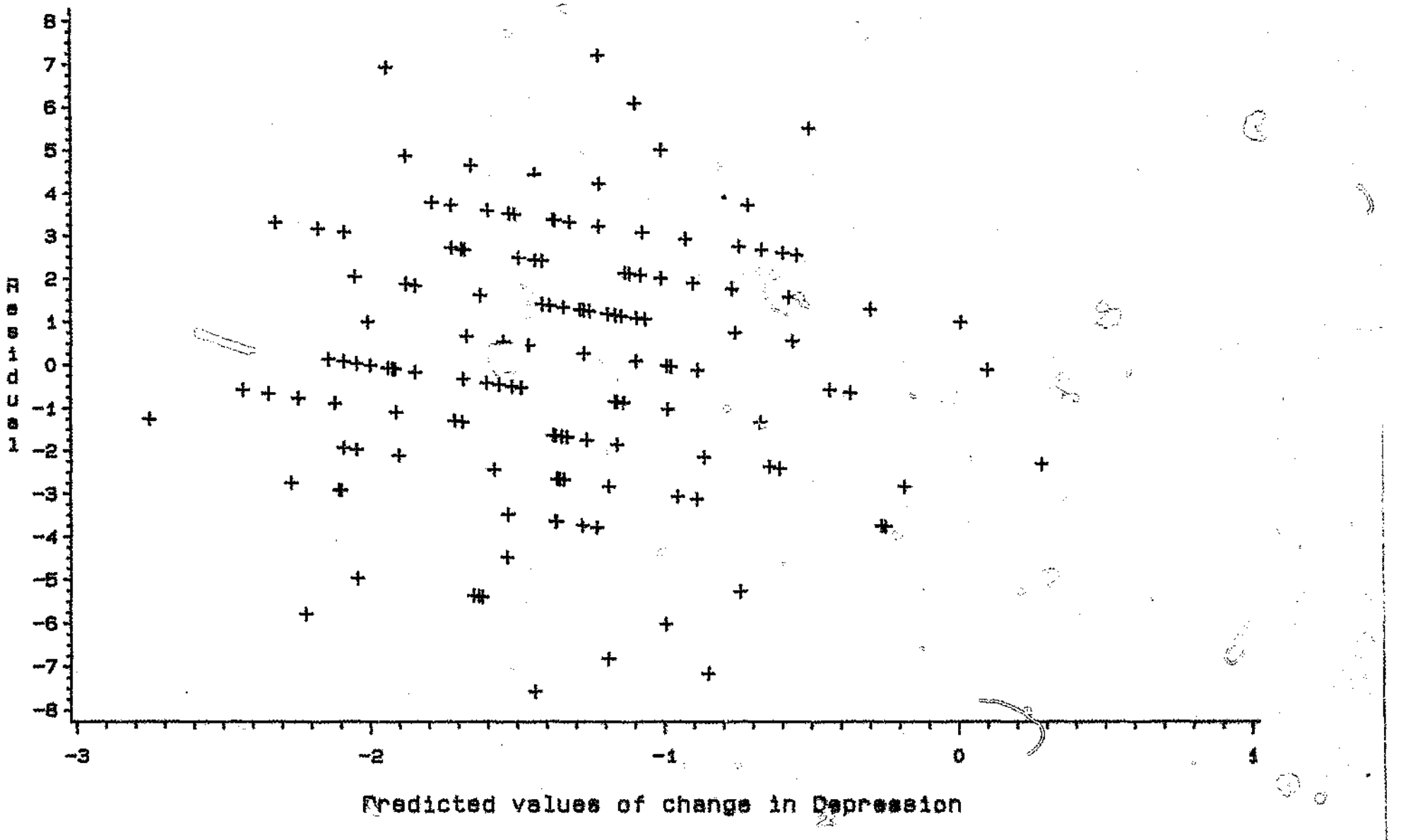
Hostility


Residual
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-5
-4
-3
-2
-1
Predicted values of change in Depression

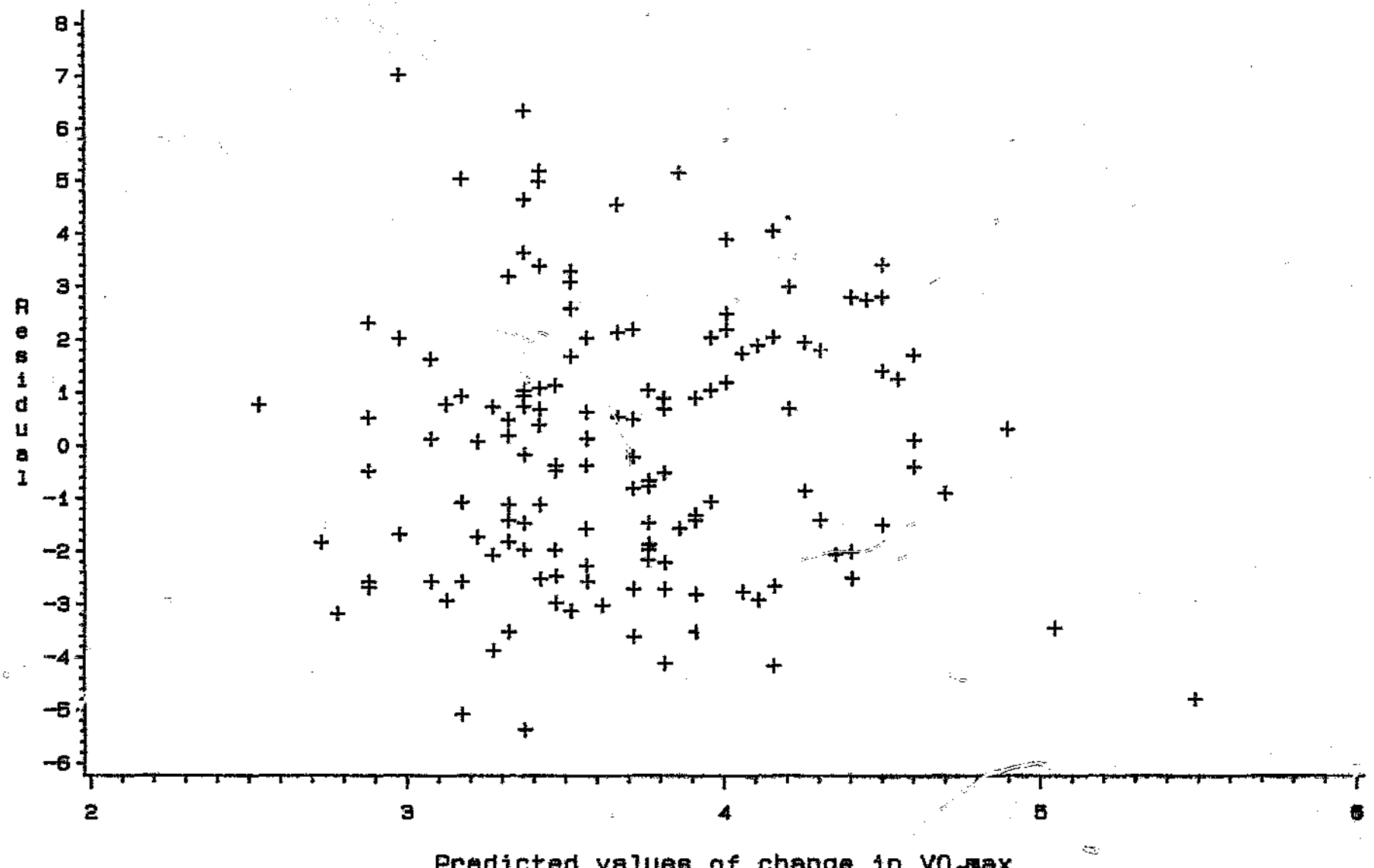
Frequency of Exercise



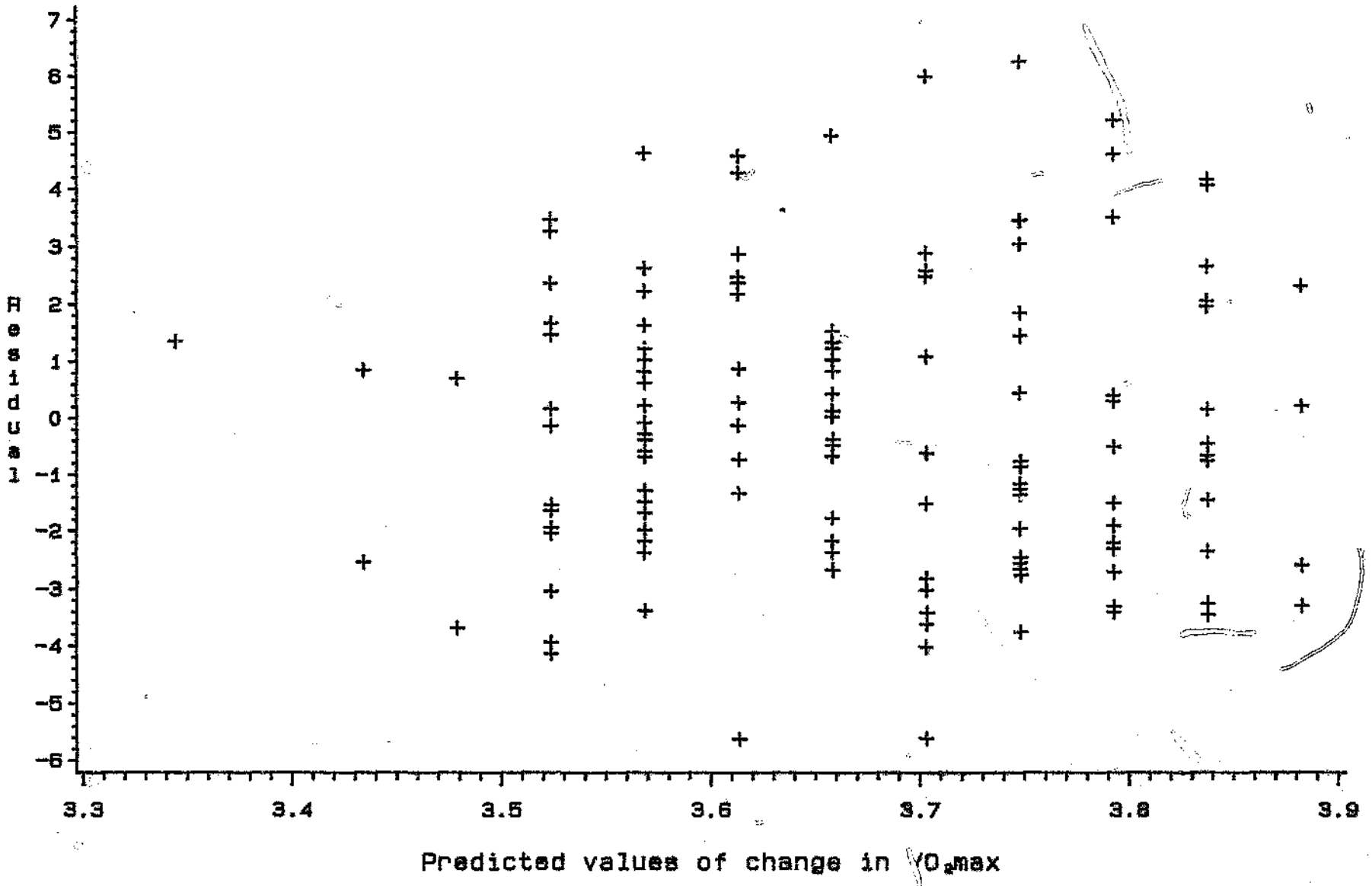
Duration of Exercise



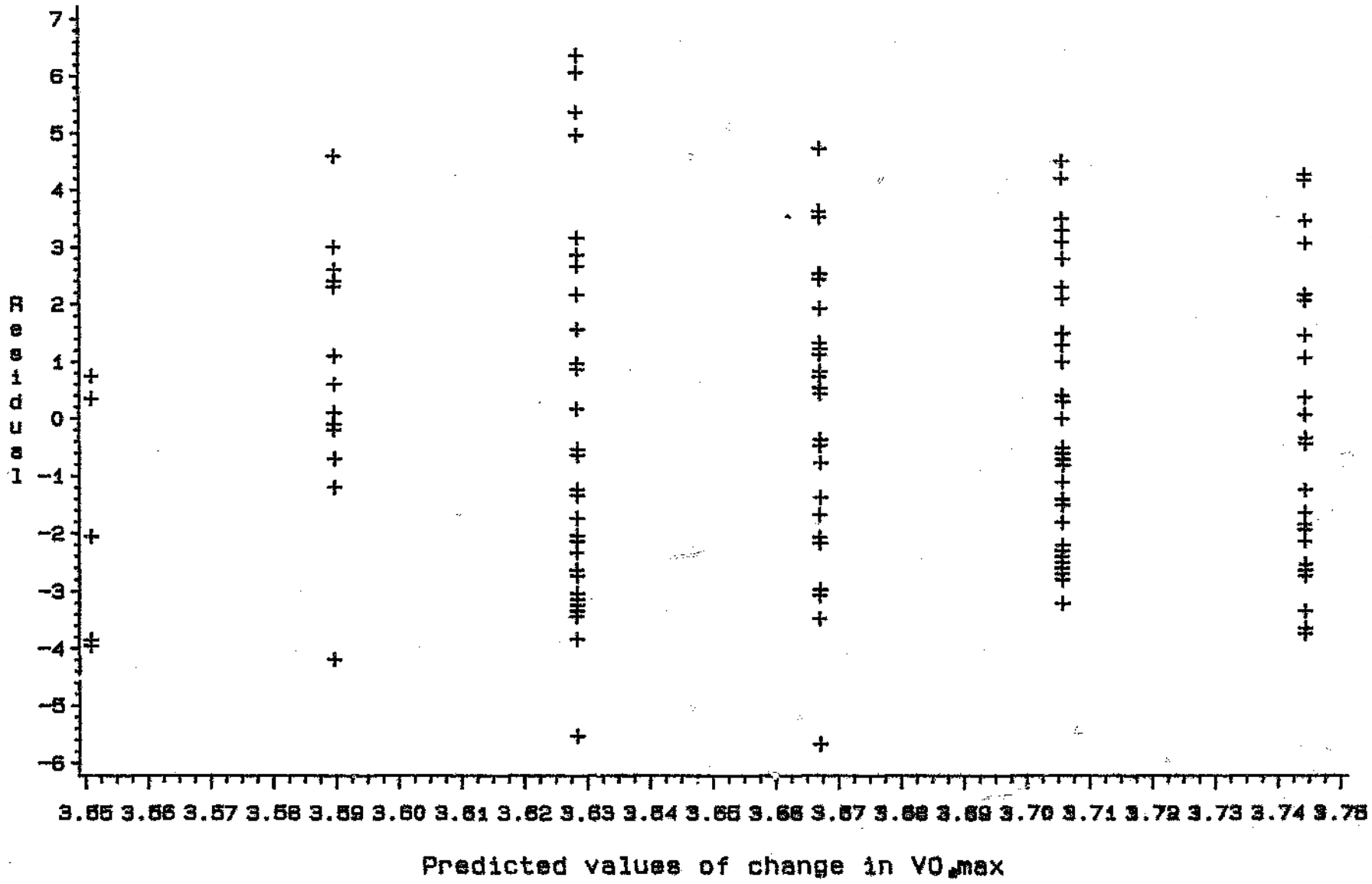
Age


Residual
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
2
3
4
5
6
Predicted values of change in VO2max

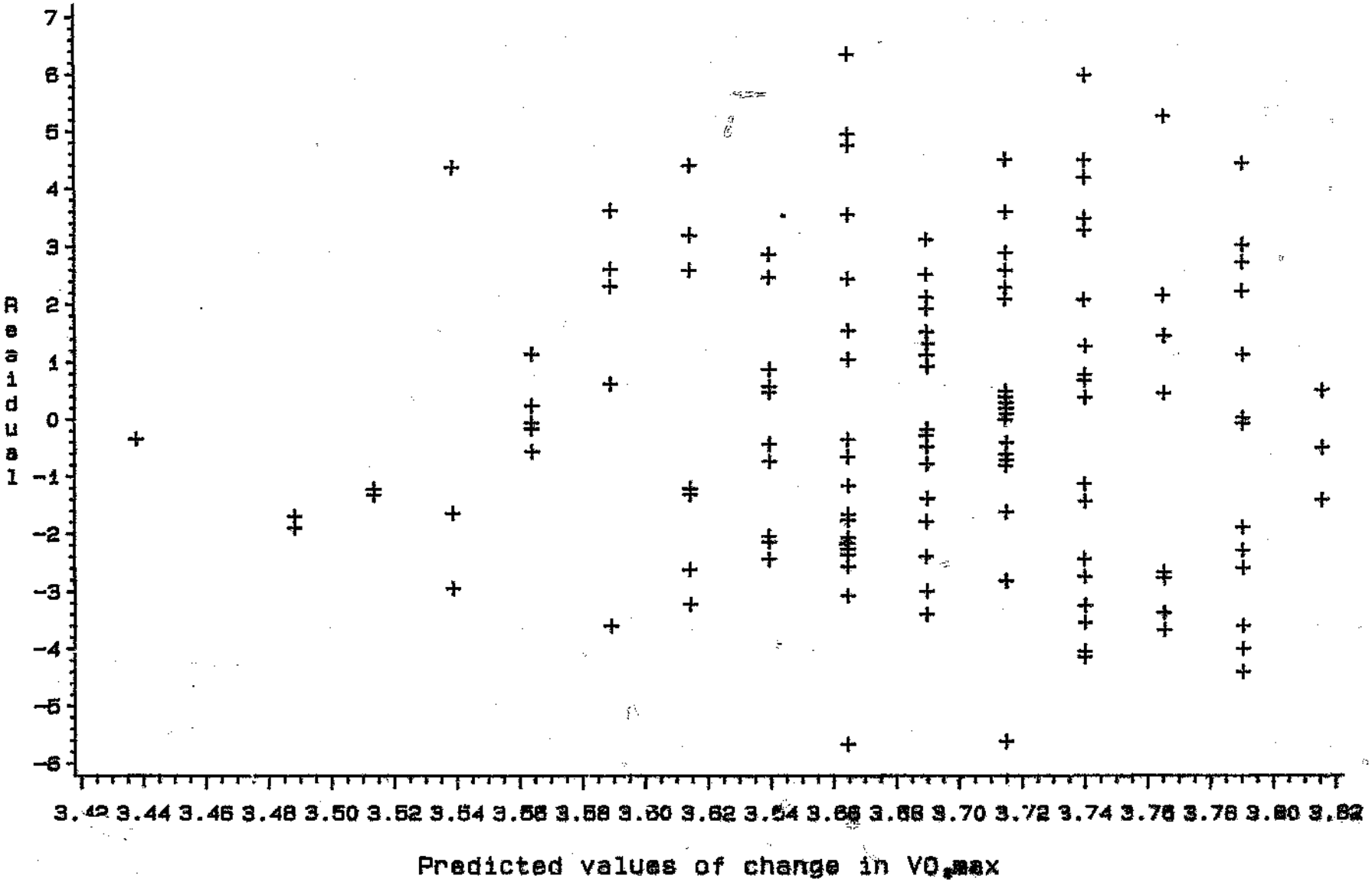
Achievement Striving



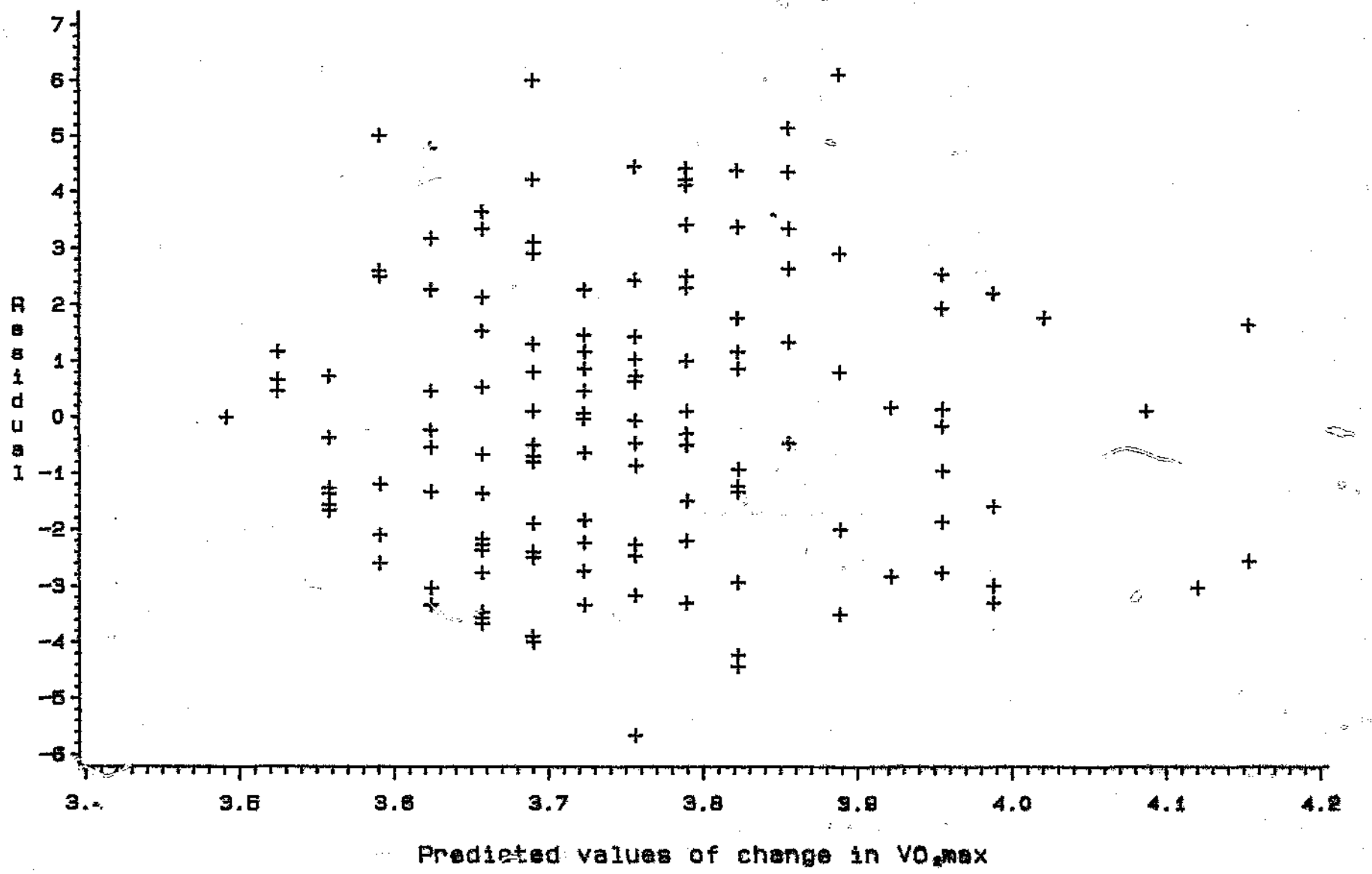
Impatience Irritability



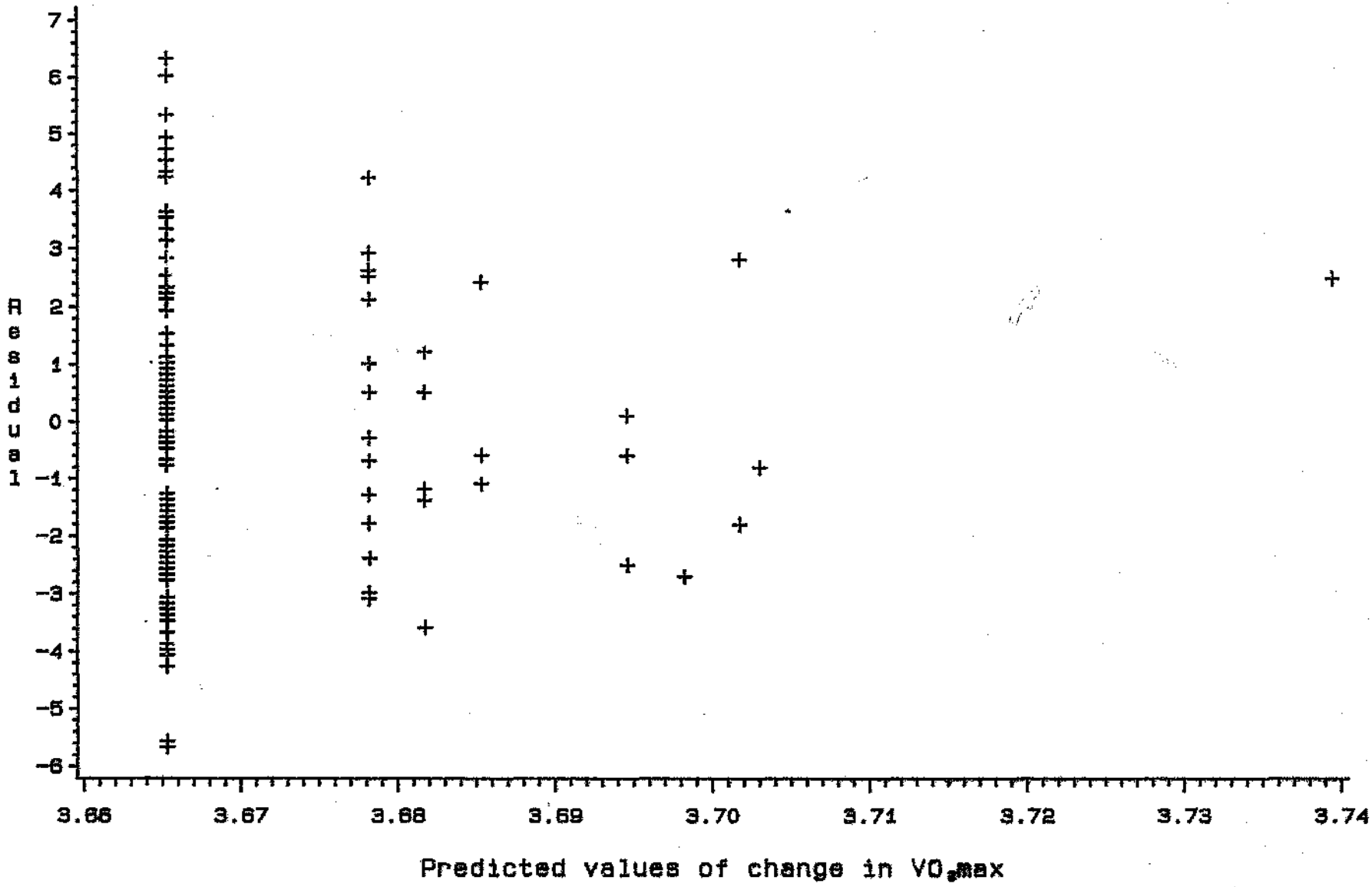
Anger—in


Residual
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
3.42 3.44 3.46 3.48 3.50 3.52 3.54 3.56 3.58 3.60 3.62 3.64 3.66 3.68 3.70 3.72 3.74 3.76 3.78 3.80 3.82
Predicted values of change in VO2max

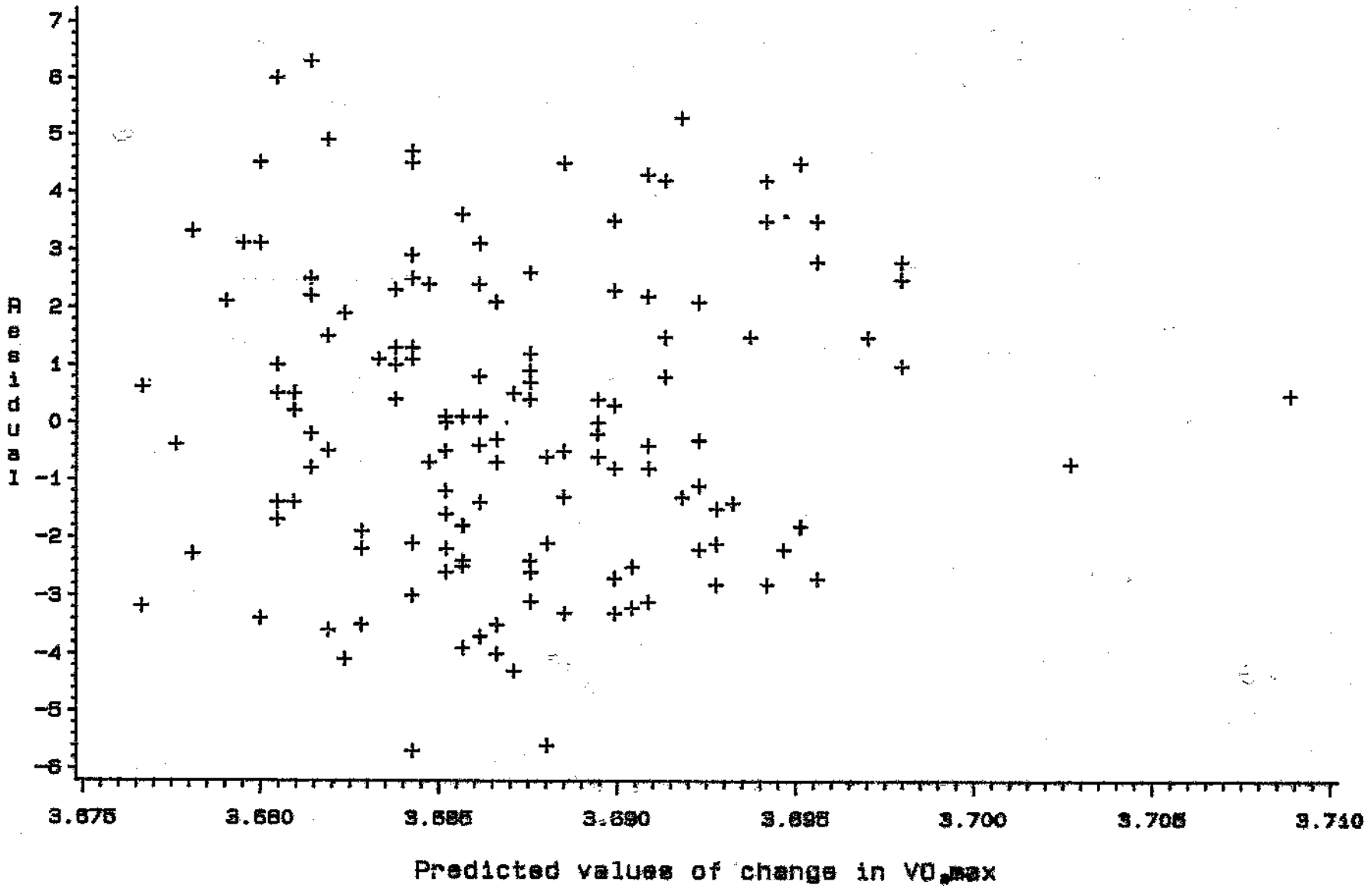
Anger—out


Residuals
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
3.5
3.6
3.6
3.7
3.8
3.9
4.0
4.1
4.2
Predicted values of change in VO2max

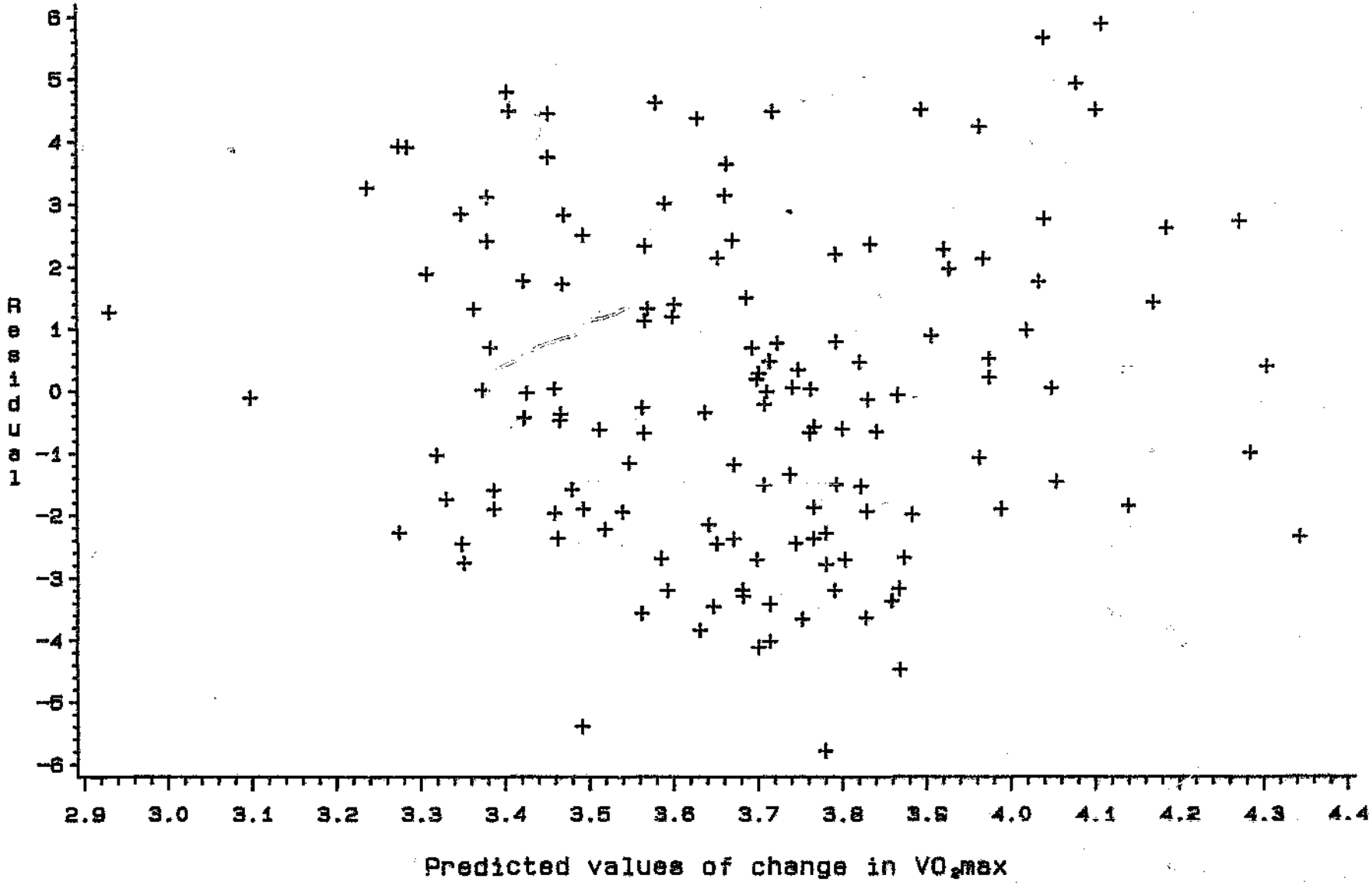
Hostility


Residual
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
3.66
3.67
3.68
3.69
3.70
3.71
3.72
3.73
3.74
Predicted values of change in VO2max

Frequency of Exercise



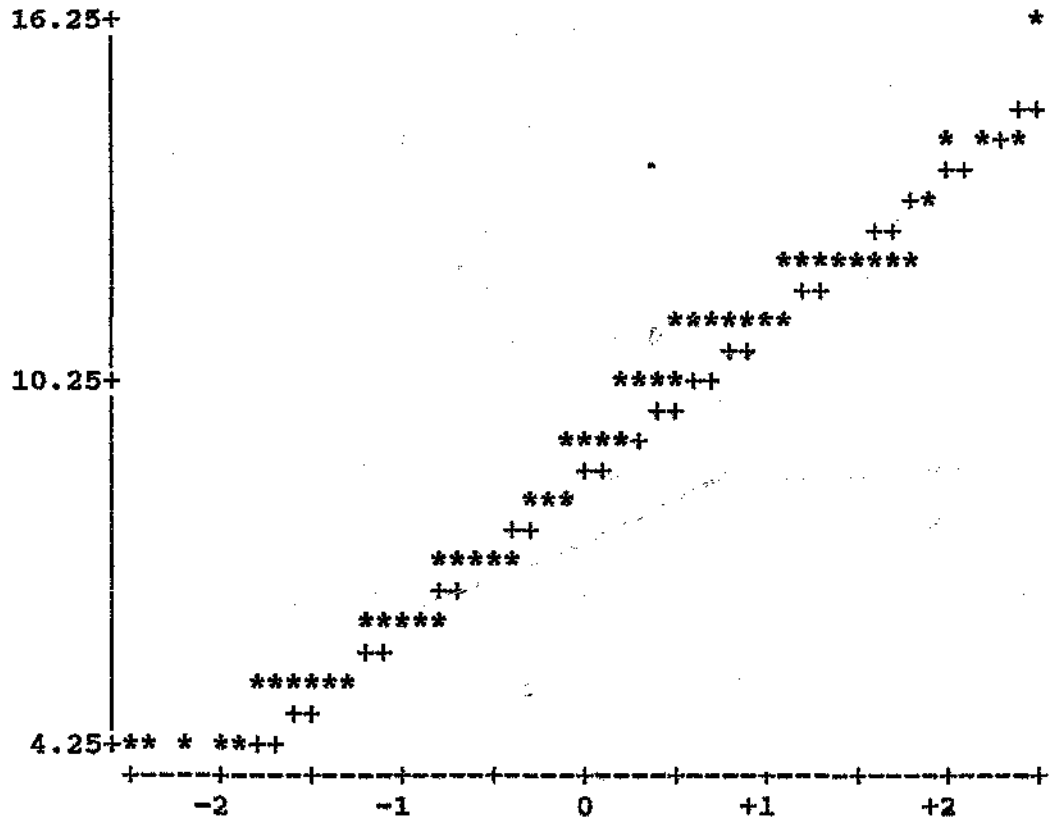
Duration of Exercise



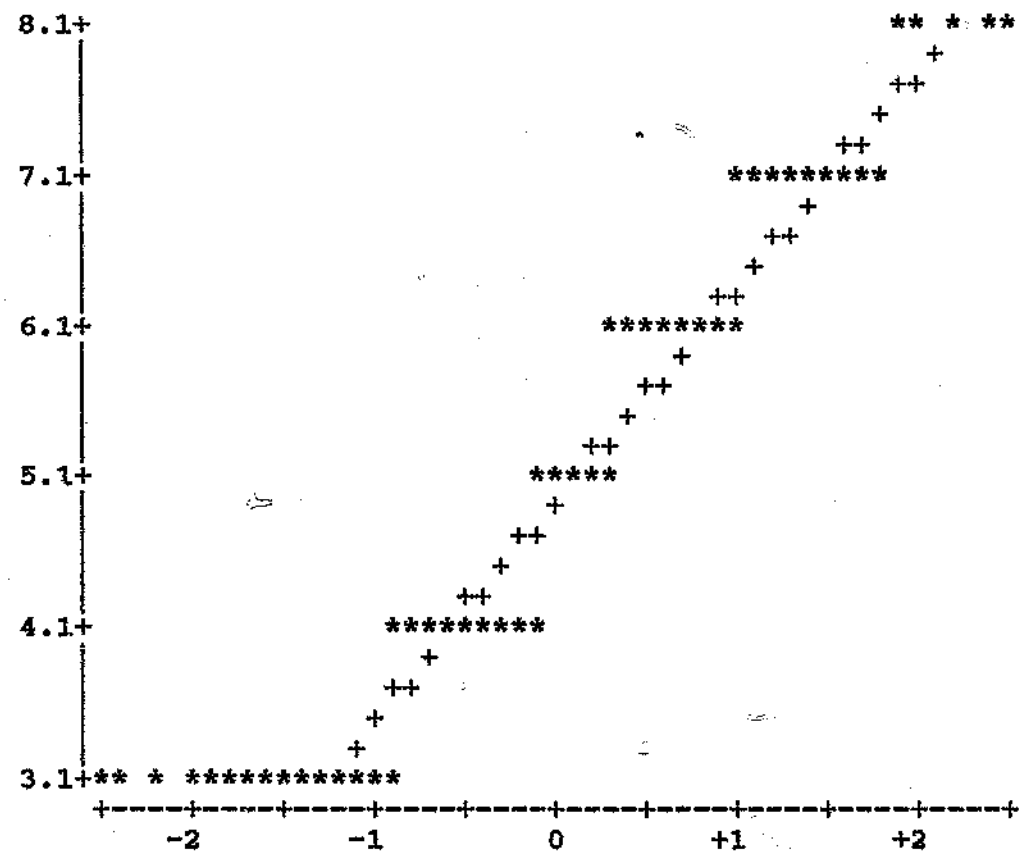
APPENDIX E

Normal Probability Plots used to Test
the Assumption of Normality

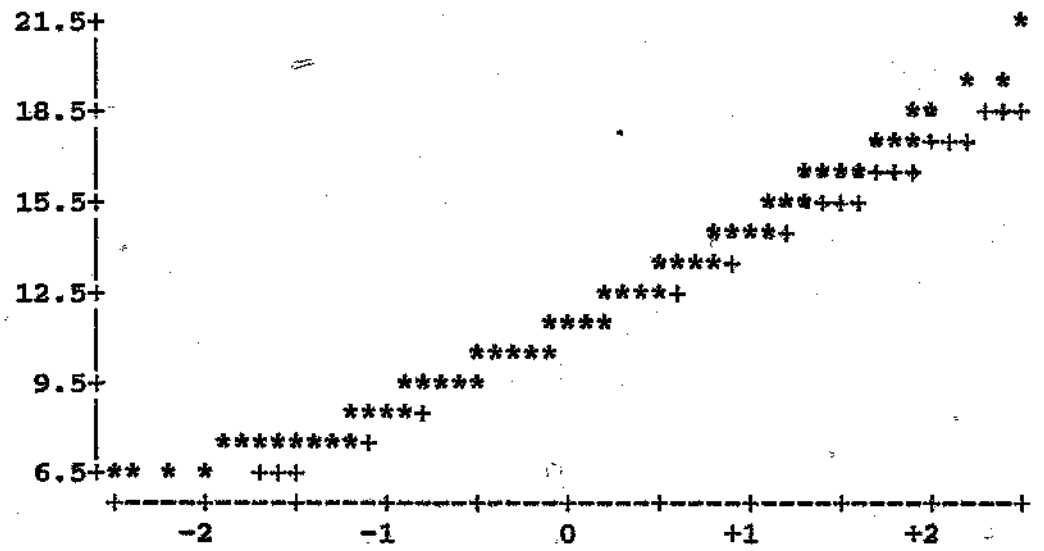
Normal Probability Plot
Achievement Striving



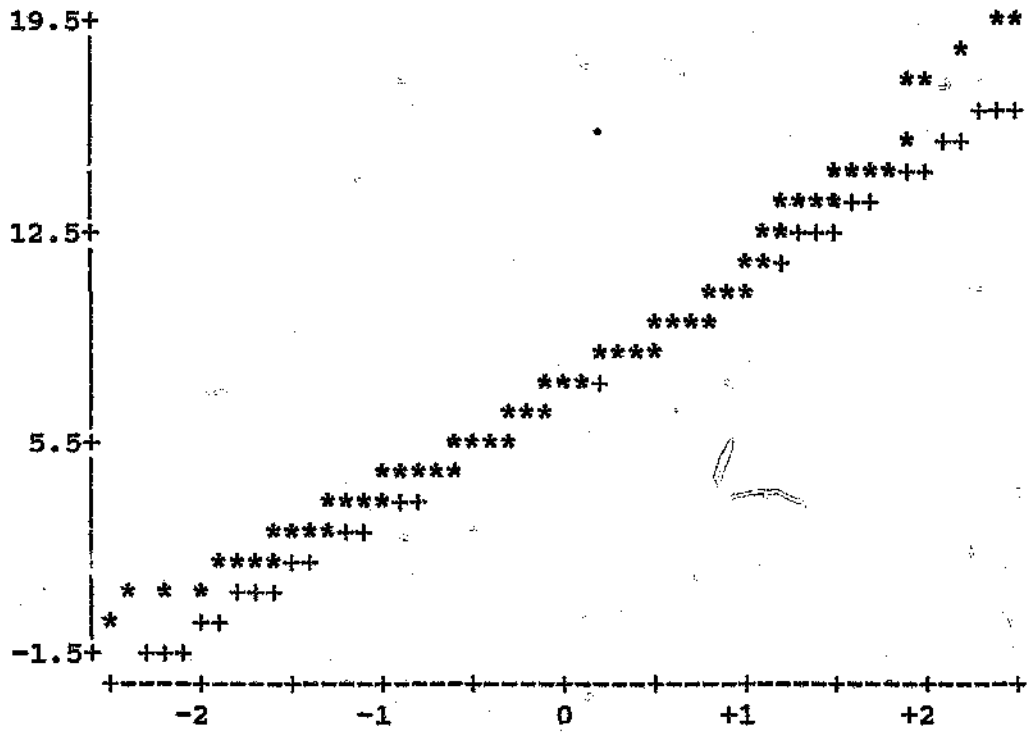
Normal Probability Plot
Impatience Irritability



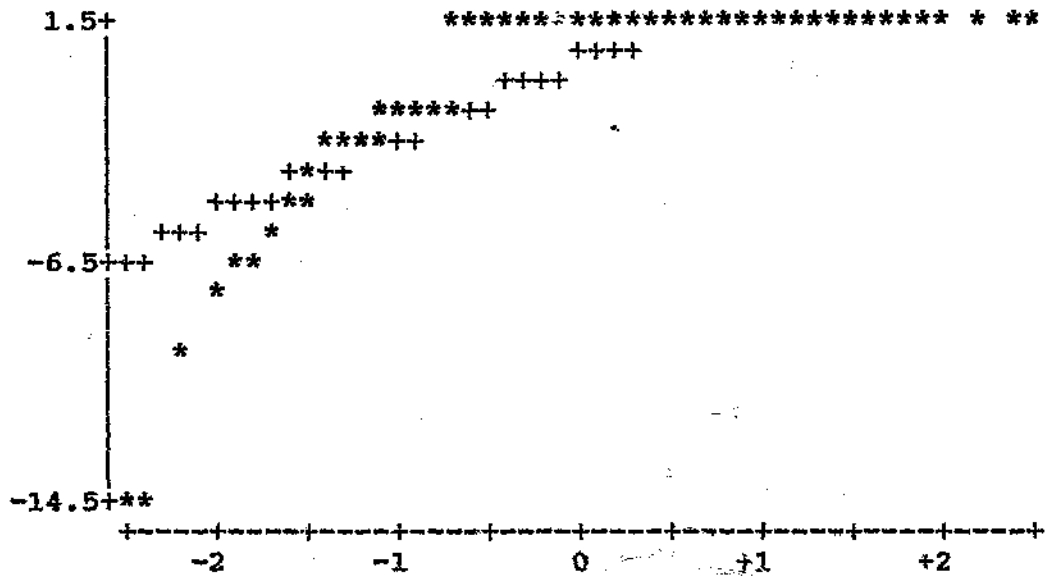
Normal Probability Plot
Auger - In



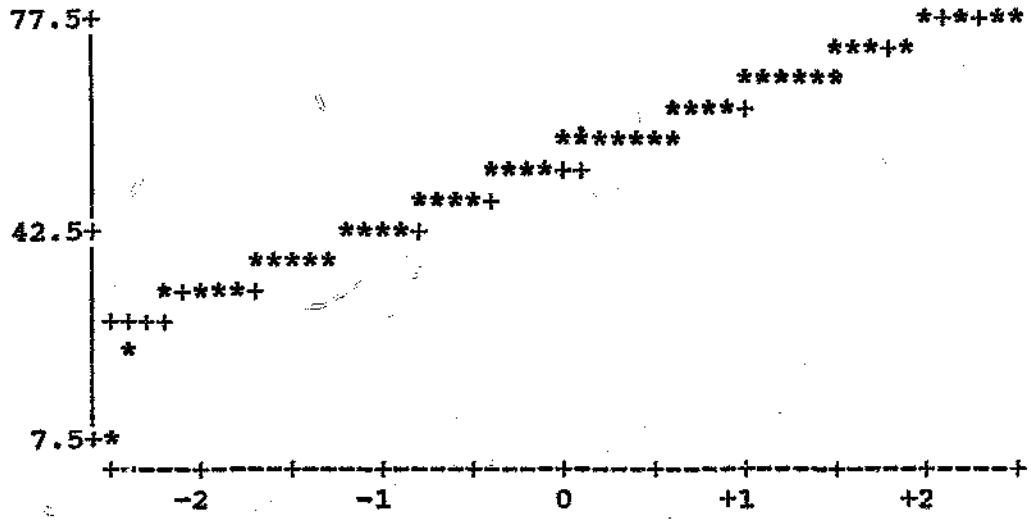
Normal Probability Plot
Anger - Out



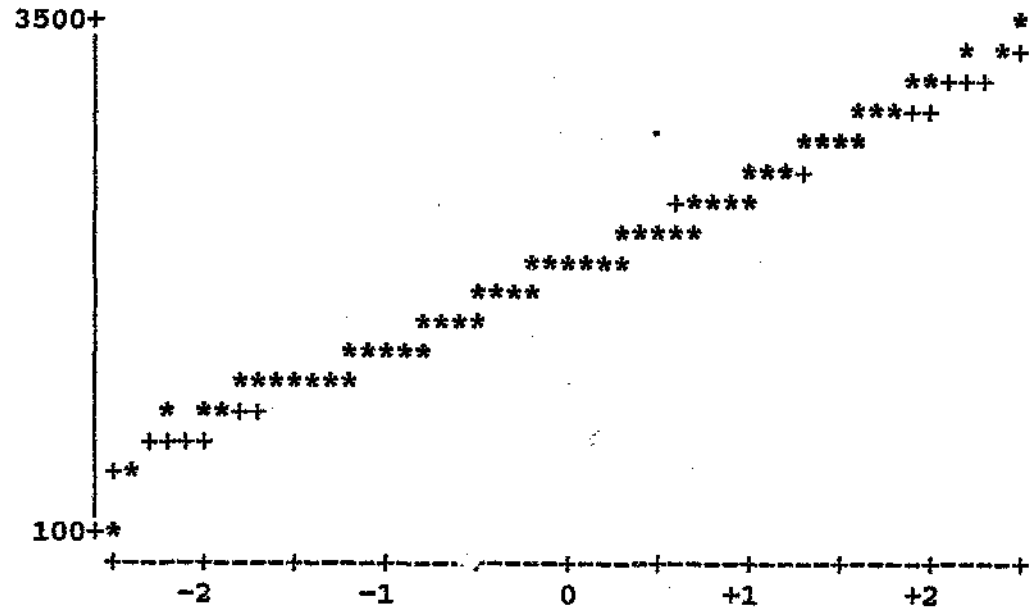
Normal Probability Plot
Hostility



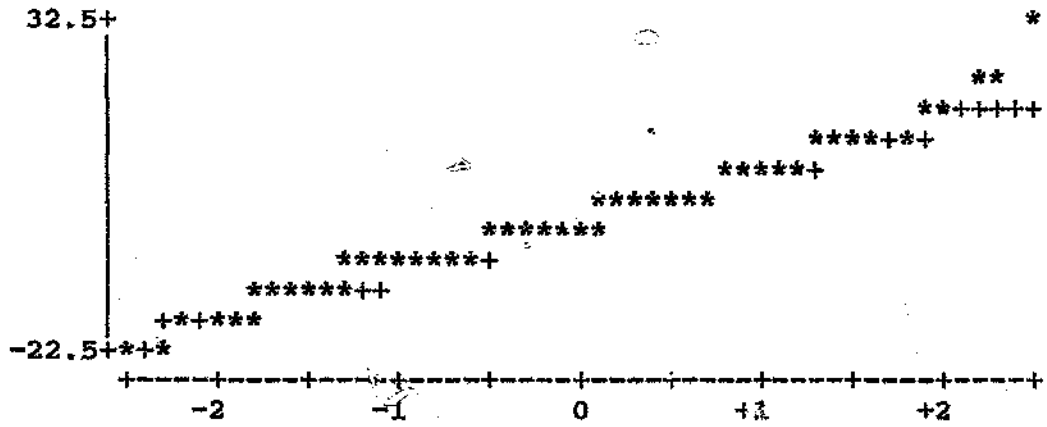
Normal Probability Plot
Exercise Frequency



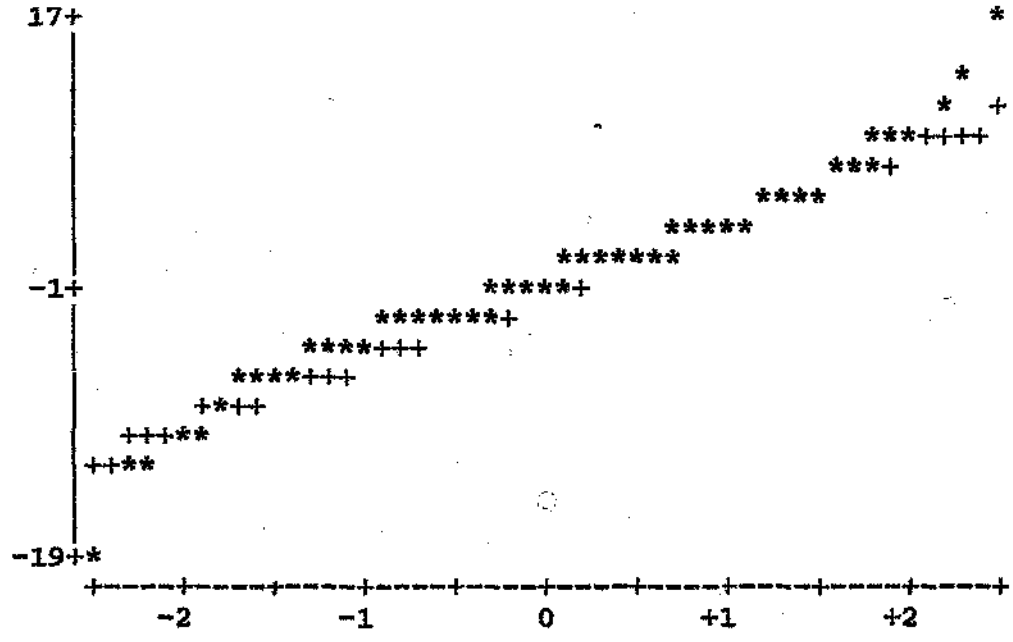
Normal Probability Plot
Exercise Duration



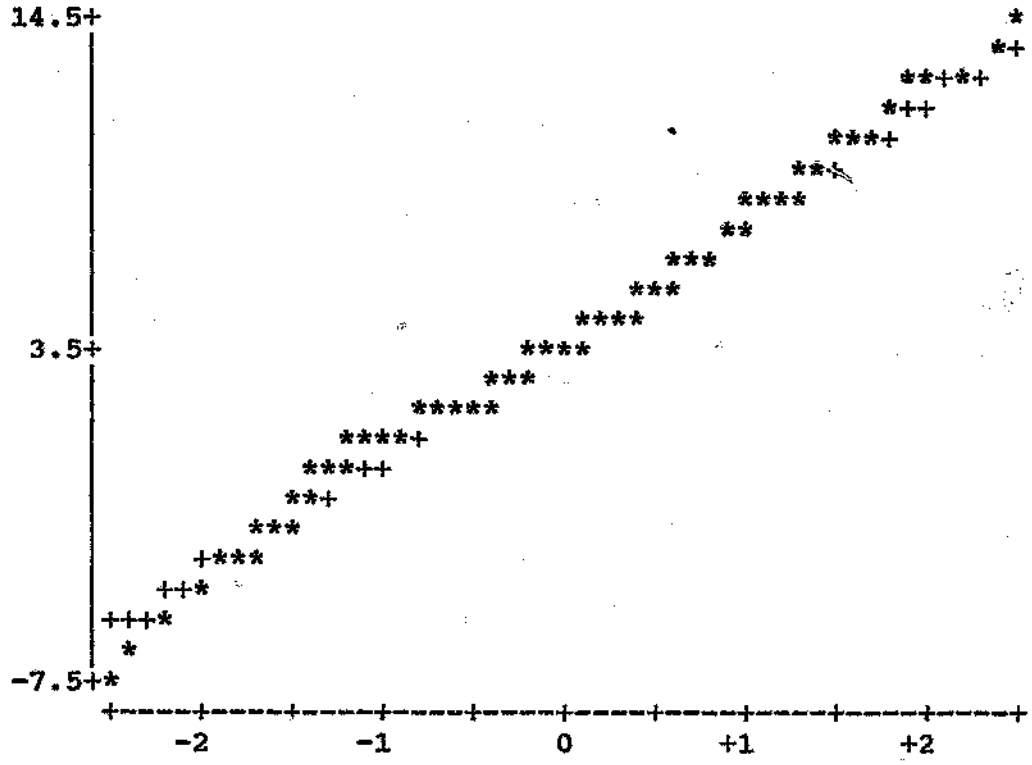
Normal Probability Plot
Change in Anxiety



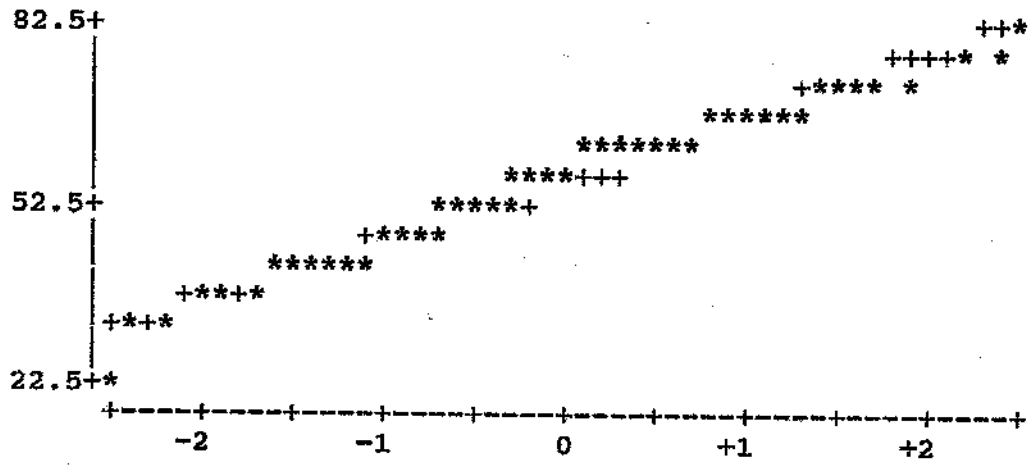
Normal Probability Plot
Change in Depression



Normal Probability Plot
Change in Maximal Oxygen Uptake



Normal Probability Plot
Age



Author: Feldner-Busztin Adrienne.
Name of thesis: Predicting the psychological and physiological prognosis of cardiac rehabilitation patients.

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