The Emotional Congruence of Experience and Bodily Change

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Abstract

This study examined the association of the experience of emotion and somatic changes. The study compared reported somatic changes generally experienced when anxious with the actual association of the experience of emotion and somatic changes as measured during a specific event. Emotions were measured as both general negative-emotion as well as specific emotions: anger, disgust, fear, sadness and shame.

Participants were volunteers from a Victorian university who agreed to watch a video depicting the dramatisation of child abuse. Throughout the video, participants indicated their experience of emotion. Measures were also taken throughout the procedure of facial expression and Galvanic Skin Response (GSR).

In order to examine emotional-congruence, subjects were divided into three groups. These groups were divided according to the congruence of subjects' experienced emotion with autonomic changes and facial expressivity. Groups were divided separately for each of the emotion types. Where there was little difference between the reported experience of emotion and that, which would have been expected from the observed somatic changes, the subject was deemed to be in the Congruent Group. Subjects whose reported experience of emotion was greater or less than would be expected from observed somatic changes were allocated to the Over-reporter and Under-Reporter Groups respectively. This data was then compared to participants' reports of the number of somatic symptoms usually experienced when anxious.

It was found that participants who under-report the experience of general negative-emotion compared with their observed somatic changes (both GSR and facial expressivity) had lower trait-somatic-anxiety (reported fewer somatic symptoms usually experienced when anxious). There was no significant difference between the Congruent Group and Over-Reporter Group. The Under-Reporter Groups had significantly lower trait-somatic-anxiety than the Congruent Group when emotional-congruence was defined by fear and GSR, anger and GSR and sadness and facial expressivity. The actual association of shame and disgust with either somatic change, sadness with autonomic change and anger and fear with facial expressivity was unrelated to the number of somatic symptoms reported to be usually experienced when anxious.

The results supported the idea that subjective reports of the number of somatic symptoms reported to be usually experienced when anxious reflect the actual association of somatic change and experience, but with limitations. The actual association of experience of fear with autonomic change seems to reflect the number of somatic symptoms reported to be usually experienced when anxious more than other emotions. Further for those for whom the experience of anger and negative-emotion has a greater association with somatic change, there was a greater number of somatic symptoms reported to be usually experienced when anxious. This would suggest that some people have a greater association of some experiences of emotion and somatic change. Furthermore, while there is an association between reported somatic changes generally experienced when anxious with the actual association of the experience of

emotion and somatic changes as measured during a specific event, this was dependant on the association of the emotion types rather than being generalised for all emotions.

Statement Regarding Research

This is to certify that this thesis contains no material that has been accepted for the award of any other degree or diploma in any University or other institution. Furthermore to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Matthew Reeder

Table Of Contents

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Tables

Figures

1. Introduction

Bodily changes associated with emotions, such as arousal and facial expression, have long been recognised as an important topic of psychological study. Arousal and the expression of emotion have been central to the work of such seminal theorists as James (1884; 1890), Freud (1916/1973) and Darwin (1872/1965). James proposed that bodily changes might influence the experience of emotion. Freud distinguished between experience and different bodily changes in the unconscious dynamics associated with emotion. Darwin recognised the role of expression of emotion in evolutionary behaviour. Each of these will be discussed later in further detail (see Section 1.2.3).

Bodily changes such as arousal and facial expression are central to how emotion is defined in scientific literature. While a single scientific definition has not received common acceptance (Izard, 1993; Lewis & Michalson, 1983; Reber, 1985), many theorists have come to define emotion by the association of bodily changes with the experience of emotion (Gross & Levenson, 1993; Izard, 1993; Krohne, Hock, & Kohlmann, 1992; Lang, 1994; Plutchik, 1994). We know emotion not just as an experience or a bodily change, but as a range of changes that often occur at the same time.

This study examined the association of bodily changes with the experience of emotion. Unlike many previous studies of bodily changes and the experience of emotion, this study examined differences between individuals in the strength of the

association of bodily change and the experience. This observed strength of association was then compared to participants' description of their own bodily changes during emotion.

1.1. The Aim of the Study

The study examined differences between people in the role of bodily changes in emotion. The aim was to examine whether some people have a greater association of emotional experience and somatic changes. This was called emotional-congruence. In particular it was examined as to whether people for whom bodily changes were more salient during the experience of emotion subjectively identified bodily changes as generally more salient during emotion. This level of subjectively identified bodily changes as generally more salient during emotion was called trait-somatic-anxiety.

The present study drew upon two constructions of emotion. Emotions may be constructed as basic types (Ekman, Levenson, & Friesen, 1983; Izard, 1977; 1994; Tomkins, 1984) or dimensions of emotionality generally (Ortony & Turner, 1990; Turner & Ortony, 1992). Basic emotion types include anger, disgust, fear, sadness and shame. Given the lack of consensus as to whether emotions reflect basic types or reflective of dimensions of emotionality, the study examined both specific emotion types and negative-emotion.

Somatic changes may also be described dimensionally. Autonomic changes during emotion have tended to be measured dimensionally (Ekman et al., 1983; Schachter & Singer, 1962) although have been measured categorically (Levenson, Carstensen, Friesen, & Ekman, 1991). While observations of facial expression has tended to be done according to categorical types (Scherer, 1992), experimental studies involving the manipulation of facial expression have been done dimensionally (Winton, 1986). The current study examined both facial expression and somatic change dimensionally. While categorical measurement was evident in the literature for both facial expression and autonomic change, the categorical measurement of autonomic change is rare and difficult to measure (Levenson et al., 1991). In order to facilitate consistent analysis, both somatic changes were measured dimensionally.

The experience of emotion has also been examined both in relation to categorical types (Izard, 1993) and dimensions (Russell, 1980). The two approaches to the experience of emotion have been argued to be complimentary (Izard, 1993). While emotions are inter-related, emotion types may also vary from one another (Izard, 1990; 1993; Lazarus, 1991; Lewis & Michalson, 1983). Emotional experience was therefore measured both dimensionally and categorically.

This study examined the association of two components of emotion: somatic change and the experience of emotion. Somatic change included both facial expression and autonomic activity. While it was recognised that all components may be described either categorically or dimensionally, changes to facial expression and autonomic activity were conceptualised dimensionally. The experience of emotion was examined

as a set of discrete or basic emotion types. The aim of the study was therefore to examine whether people for whom bodily changes were more salient during the experience of emotion subjectively identified bodily changes as generally more salient during emotion. A secondary aim of the study was to examine whether this was supported whether emotional experience was measured dimensionally and categorically.

1.2. The Component Approach to Emotion

Emotions may be defined by the association of its components. Emotions involve changes to a number of major human systems including the cognitive, behavioural, neural and physiological systems. These changes may be divided into three groups of changes and emotions may be defined by the association of such changes: (1) cognitive changes involved in the initial intake and processing of information, (2) somatic or bodily changes and (3) experiential changes including the application of emotion adjectives. There are many variables involved in the initial processing of information associated with any emotional change (Arnold, 1960; Lazarus, 1966; 1981; 1982; Lazarus, Averill, & Opton, 1970; Lazarus & Folkman, 1984; Mandler, 1975; Roseman, 1984; Schachter, 1966; Schachter & Singer, 1962; Scherer, 1992). There are also ranges of somatic changes following the intake and processing of information that may be identified. These changes include changes to the muscles of the face associated with expression (see Section 1.2.5) and changes to the

autonomic nervous system (see Section 1.2.4). Such changes may affect blood pressure, body posture, vocal tone, pupil dilation, heart rate, breathing rate, skin conductivity, adrenalins (and noradrenalines) secretion and gross motor behaviours. There is also significant variation within and numerous aspects to the experiential component including subjective affect, internal dialogue and visual images (see Section 1.2.2). All such changes may, however, be grouped within the three components listed above.

The approach of defining emotion by the association of changes to components of emotion following the intake and processing of information has become increasingly apparent in the literature (Cacioppo et al., 1992; Lewis & Michalson, 1983). This approach is, however, thematically apparent also in the early literature. In Freud's (1916/1973) description of emotion he distinguishes between feelings, affectivity and motility which seem to correspond to the experience, arousal and expression of emotion respectively. The construction of emotion as a relationship between the three components of experience, behavioural and physiological changes have been common to a number of models of emotion. The three-component model has been used in psycho-evolutionary theory (Plutchik, 1962; 1994), the organizational approach to developmental psychology (Lewis & Michalson, 1983), differential emotions theory (Izard, 1984; 1993) and cognitive theories (Lazarus, 1991; Schachter & Singer, 1962). Such theories diverge in terms of the relationship of components, but all use the language of a three component system to describe emotion. The three-component approach to emotions is also reflected in a number of empirical studies of emotion

(Bindra, 1969). Observations that components within components have a greater co-variance than components of differing components, support the component approach (Lang, 1994).

This study of emotion was based upon a three-component model of emotion. Specifically, the study was concerned with emotional-congruence, the association of somatic changes and the experience of emotion. Prior to examining the literature related to the association of somatic change and the experience of emotion, the literature about each of the three components will be briefly examined.

1.2.1. The Intake and Processing of Emotional Information

Cognitive processes involved in the intake and processing of information may be included as a variable component of emotion (Bindra, 1969; Lewis & Michalson, 1983). The seminal work Arnold (1960) highlighted the processes of appraisal in emotion. Arnold (1960) argued that a significant stage in the intake and processing of information for emotions was a cognitive process of identifying significant stimuli requiring a response. The basic construct of appraisal has remained a stable, central tenant of the cognitive approach to emotion. The parameters of such mental analysis have, however, become more delineated and the number of dimensions of appraisal has been expanded significantly by subsequent theorists (Lazarus, 1991). Lazarus, who identified two dimensions of appraisal (primary appraisal, secondary appraisal), was the first to expand Arnold's theory. Theorists have subsequently expanded this model and further dimensions of appraisal have been identified (Clore et al., 1987; Fridja, 1987;

Fridja, Kuipers, & ter Schure, 1989; Lazarus, 1991; Ortony, Clore, & Collins, 1988; Ortony, Clore, & Foss, 1987; Ortony & Turner, 1990; Turner & Ortony, 1992; Weiner, Russell, & Lerman, 1979).

Appraisal and other cognitive processes involved in the intake and processing of information are clearly important in understanding emotion. Appraisal has been modelled as differentiating of emotion types (Izard, 1993; Lazarus, 1991; Oatley & Johnston-Laird, 1987; Ortony et al., 1988; Smith, 1989). Appraisal has also been associated with specific predictable changes to both facial expressions (Scherer, 1992) and the autonomic nervous system (Fridja et al., 1989). Variations in the patterns of appraisal have been identified as predictable across individuals (Mathews & McLeod, 1985). Some emotion theorists describe emotion solely in terms of a by-product of appraisal (Lazarus & Folkman, 1984; O'Connor, Lorr, & Stafford, 1956; Ortony et al., 1988; Ortony & Turner, 1990; Turner & Ortony, 1992) although this position has been widely criticised (Izard, 1993; Zajonc & Markus, 1984).

While it is recognised that appraisal and other cognitive processes involved in the intake and processing of information are important in the understanding of emotion, they are not examined in this study. This study focused on the relationship of the other components of emotion: experience and somatic change. It was assumed that appraisal and other cognitive processes involved in the intake and processing of information may influence both experience and somatic change.

1.2.2. The Content of Emotional Experience

Emotional experience may be simply defined as the range of components of emotion that are experienced by the participant. This may include the conscious labelling of a specific emotion or may include the experience of a diffuse feeling, the recollection of an associated memory or belief or the perception of any bodily change associated with that emotion (Izard, 1984). Any experience that is associated with an emotion may be defined as an emotional experience.

Emotional experience is clear when a person applies socially defined labels to their own state. When a person vocalizes or sub-vocalizes “I feel sad" and the feeling is identified without intention to deceive a second person, that application of a label may be deemed to be the experience of emotion. Research has indicated that some children can use a small number of affect labels such as happy, sad, angry and scared as young as two years of age (Zahn-Waxler, Radke-Yarrow, & King, 1979).

Adults can express a broad range of verbal labels of emotion. In one study 200 participants wrote down all the emotional terms they could in one minute (Smith, 1989). The data was reduced by compounding all syntactic variants, such as sad and sadness, as well as words only stated by one participant. The results were that 196 terms were derived with happiness being the most commonly recorded term (152 participants). Many theorists would argue that some terms associated with emotion are not true emotions (Lazarus, 1991). Furthermore, it is argued that without a clear definition of emotion there is no basis for discriminating which terms associated with emotion are

true emotions and which are not. For example, it is disputed as to whether attention is an emotion. Furthermore, it is recognized that many emotional terms are strongly associated and may indicate only a slight variation in meaning (Smith, 1989). Also untested is the relationship between emotional terms recalled and emotional terms either vocalized or applied to one's own emotional experience. The above results may therefore not indicate 196 discrete emotional experiences.

The experience of emotion is not exclusively associated with the application of emotional adjectives. Emotions may be experienced as a visual image (Izard, 1984), a set of complex beliefs (Ortony et al., 1988; Ortony et al., 1987; Ortony & Turner, 1990; Turner & Ortony, 1992), a memory recalled (Gilligan & Bower, 1984), an impulse to act in a particular way (Arnold, 1960) or a bodily change associated with emotion that is perceived (Izard, 1984). Emotional experience may therefore be defined to include a number of related components: affective labels, self-talk, images, memories and the pre-verbal perception of emotion related bodily sensation. Research, however, has tended to study emotional experience by the application of affective labels.

1.2.3. The Somatic Components of Emotion

The current study examined the relationship of emotional experience to the bodily or somatic changes during emotion. Two main bodies of research may be identified in the study of the relationship of somatic change and emotional experience. The first examines changes to the muscles of the face (Izard, 1994; Scherer, 1992). The second examines the group of changes to the nervous system associated with autonomic

arousal (Izard, 1993; Lang, 1994; Shields & Simon, 1991). These bodies of research have tended to be quite separate.

Other somatic changes may also be associated with emotion: fear with running away or screaming, rage with fighting, excitement with jumping and shame with hanging one's head (Lewis & Michalson, 1983). Such behaviour includes changes to vocal tone, body posture and gross motor behaviour associated with either approach and avoidance strategies. While such behaviours have been identified within models of emotion (Lewis & Michalson, 1983; Scherer, 1992), there has been less study of these components than facial expression or autonomic changes. These other somatic changes were not examined in this study.

1.2.4. Autonomic Arousal

Emotions such as anger, joy and fear have become associated with a number of bodily or somatic changes. Such changes include dilation of the pupils, inhibition of the flow of saliva, acceleration of the heart beat, dilation of the bronchi of the lungs, increased secretion of adrenalin or noradrenaline and inhibition of bladder contraction. The changes to internal organs and the circulation of fluid within the body have become known as the autonomic nervous system (Gaskell, 1916; Lang, 1993; Langley, 1921; Plutchik, 1994). The recognition that changes to internal organs and the circulation of fluid were part of a broader system can be traced to early this century (Gaskell, 1916; Langley, 1921).

There is high activity of the autonomic nervous system during some emotions (Gross & Levenson, 1993; Izard, 1993; Lazarus, 1991). Such high activity has become associated with activation of a collection of nerve cell bodies and synapses (the chain of ganglia) on either side of the spinal cord (Gray, 1990; Izard, 1993; LeDoux, 1992; Panksepp, 1992). The nerve cell bodies and synapses are associated with nerve fibres originating at the thoracic and lumbar parts of the spinal chord. This is called the sympathetic nervous system. Relaxation of the autonomic nervous system, and hence the absence of certain emotions, is associated with nerve fibres that originate in the cranial and sacral parts of the spinal cord and are called the parasympathetic nervous system (Gray, 1990; Izard, 1993; LeDoux, 1992; Panksepp, 1992).

The functional nature of the autonomic nervous system has been used to argue its consistency with evolutionary theory (Lewis & Michalson, 1983; Plutchik, 1994; Scherer, 1992). The bodily changes associated with emotions such as anger and fear facilitate action. Heart rate increases, for example, have long been associated with anxiety and anger (Gaskell, 1916; Langley, 1921). The utility of increased heart rate is that this facilitates a greater distribution of oxygen throughout the body that prepares the body for increased activity, such as defending oneself or escaping. Such evolutionary theorists argue the physiological and neurological changes within the body thus prepare the body to respond to the organism's environment (Lewis & Michalson, 1983; Plutchik, 1994; Scherer, 1992).

The sympathetic nervous system is associated with a number of emotions; fear, anger and joy (Schachter & Singer, 1962). This is precisely because a number of

emotions are associated with a vigorous behavioural response. Rage, for example, is associated with a fight while fear and anxiety are associated with flight. The activation of the sympathetic division of the autonomic nervous system facilitates the range of behavioural responses associated with emotion (Plutchik, 1994). The aggregate arousal of the autonomic nervous system therefore is not indicative of a particular emotion.

A cautionary note has to be made in terms of the robustness of the construct of the autonomic nervous system as an homogenous system. There is a strong covariance between each of the components of autonomic activity with the intensity of the stimulus (Kimble, 1990). There is however, only a weak within participant correlation between components. There have also been instances of negative correlations for heart rate and skin conductance (Lacey, Kagan, Lacey, & Moss, 1963).

1.2.5. Facial Expression

The scientific study of the relationship between emotion and facial expression seems to have first become prominent in the work of Charles Darwin (Plutchik, 1962; 1980; 1991; 1994). Darwin's (1872/1965) *The Expression of the Emotions in Man and Animals* stressed the continuity between man and animals. Specifically Darwin observed that animals displayed wonder, curiosity, imitation, attention, memory, reasoning, and even a sense of beauty. These displays were all overt behaviours but Darwin tended to emphasise facial expressions.

In the broad sense of the term emotional expression signifies any means by which an organism represents qualities of an internal physiological or cognitive state to the external world (Buck, 1984). Expressions tend to communicate. The degree to which organisms share associations between such expressions and internal constructs determines the degree to which expressions are actually and accurately communicative. Some emotional expressions utilise intentional, arbitrary, socially defined symbols. Such communication tends to be verbal, often involving quite sophisticated language (Buck, 1984). Non-verbal behaviour may also include intentional, arbitrary, socially defined symbols (Ekman, Sorenson, & Friesen, 1969) such as the sign language of the deaf. Given that symbols are intentionally communicative, it seems circular and illogical that they add to conscious experience. It would be counter-intuitive to believe that a person knew they were sad because they had just said that they were sad. Facial expression is, however, an emotional sign rather than an emotional symbol. The use of emotional symbols may be differentiated from the use of emotional signs in that an emotional sign are neither intentional, arbitrary nor socially defined (Ekman et al., 1969).

1.3. The Influence of Somatic Changes on the Experience of Emotion

The current study assumed a model of emotion in which both somatic changes and cognitive processes may contribute to the experience of emotion. As will be discussed while a model of autonomic influence on emotional experience may be traced

back to the late nineteenth century, (James, 1884; Lange, 1885/1922), such a model has been supported by more recent research (Reisenzein, 1983; Schachter & Singer, 1962). There has also been support for the theory that experience is affected by facial expression (Laird, 1984a; Scherer, 1992). Such research supports the basic premise of the James-Lange hypothesis; that somatic change may influence the experience of emotion. This would suggest rather than a person's heart racing because they feel scared, they feel scared because their heart is racing.

The proposition that somatic changes may lead to the experience of emotion was proposed by James (1884) and Lange (1885/1922). The model, however, was later discredited when a detailed criticism based on experimental work and neurological theory was published (Cannon, 1927; 1929; 1931). It was argued that rather than somatic changes leading to the experience of emotion, all components of emotion were the outflow of the thalamus, part of the forebrain (see Appendix 1).

It was later found that when autonomic changes were directly manipulated, somatic changes influenced the experience of emotion albeit in interaction with environmental perceptions. In their classic study Schachter and Singer (1962) were able to reliably produce different emotional experiences by independently manipulating the arousal of the participants and the social situation. The procedure involved partitioning the participants into an aroused and a non-aroused group by means of a chemical injection. Participants were then asked to complete a questionnaire of ridiculous length and content. Each participant was paired with a stooge participant who either became amused or agitated. It was found that aroused participants either

became amused or agitated depending on the reactions of the other person. There no was response from participants who were not aroused. Schachter and Singer concluded that emotion could be explained in terms of a combination of perception of internal state with perceptions of external content.

Other investigations have also found that somatic changes may precede the experience of emotion. Neurological examinations have found that while no area of the brain can produce emotional experience without behavioural/autonomic change, autonomic arousal may be elicited without the experience of emotion (Delgado, 1966). A position that somatic and experiential components of emotion are independent, therefore, would seem unlikely. Also the manipulation of facial expression has ben found to influence the experience of emotion (Laird, 1984b; Scherer, 1992; Tourangeau & Ellsworth, 1979; Winton, 1986). Studies of the association of facial expression, autonomic change and the interaction of both somatic changes with the experience of emotion will be examined separately.

1.3.1. Further Evidence From Autonomic Feedback Theory

Following the work of Schachter and Singer (1962) there were a number of attempts to replicate the findings (Reisenzein, 1983). While results of subsequent research tended to be positive, studies have provided only limited support for the relationship between physiological arousal and emotional experience (Reisenzein, 1983; Schachter, 1966; Schachter & Singer, 1962). Schachter argued that such studies were

limited by an inability to measure both physiological arousal and emotional experience directly.

In a classic study, two bridges were laid across the Capilano River in British Colombia (Adler & Carey, 1980). In the first condition the bridge was narrow, swinging and 230 feet above rocks that were clearly visible. In the second condition the bridge was wider and sturdier. Male participants were asked to go across one of the two bridges. An attractive woman at the end of the bridge then intercepted participants. The woman gave participants her telephone number in the process of asking them to help her with a questionnaire. Results indicated that a greater percentage of the men who crossed the narrow, swinging bridge called the woman. Adler and Carey reported that the significant difference between the two conditions was the result of the first condition eliciting physiological arousal in the participants. In accordance with the cognitive theory of emotion, participants who were physiologically aroused were likely to interpret their arousal as indicating attraction towards the woman with the questionnaire.

Subsequent studies of emotion have supported the general assertion that autonomic arousal affects the intensity of emotional experience while cognitive appraisal affects the type of emotion experienced (Kimble, 1990; Krohne, 1986; Maslach, 1979; Reisenzein, 1983; Schatcher, 1970; Von Holst & Von Saint Paul, 1970; Zillman & Bryant, 1974). Such studies have found that Schachter's findings may be replicated across conditions (Adler & Carey, 1980; Reisenzein, 1983), emotion types (Reisenzein, 1983; Zillman & Bryant, 1974) and even species (Von Holst & Von Saint

Paul, 1970). None of these studies however examined differences between individuals with respect to the association of autonomic change and the experience of emotion.

Neither the study of Adler and Carey (1980) nor other studies of Schachter's theory (Maslach, 1979; Schatcher, 1970; Von Holst & Von Saint Paul, 1970; Zillman & Bryant, 1974) directly measured either physiological arousal or the experience of emotion. In both cases arousal was assumed to have occurred given the procedures rather than because of direct measurement. Emotional experience was inferred from the aggressive behaviour of the roosters in one study (Von Holst & Von Saint Paul, 1970) and men participants returning a call to an attractive woman in another (Adler & Carey, 1980). In both studies the operationalisation of constructs seems open to criticism.

1.3.2. Evidence from Facial Feedback Theory

Both the James-Lange hypothesis and the subsequent work of Schachter and Singer (1962) were based on a model of the experience of emotion derived from autonomic changes. There has, however, been significant evidence that other somatic changes also influence the experience of emotion; other somatic changes include changes to the muscles of the face. Literature related to the relationship between facial expression and experience has tended to support at least some level of facial feedback in the development of emotional experience. Laird (1984b) reviewed experimental studies in which facial expression was the independent variable and the emotional experience was the dependent variable. Only one published study was reviewed that did not support the relationship (Tourangeau & Ellsworth, 1979). Laird et al. (Duncan & Laird,

1980; Duncan, 1977; Edelman, 1984; Kellerman & Laird, 1982; Laird & Crosby, 1974; Laird, Wagener, Halal & Szegda, 1982) carried out seven of the 10 studies that supported a relationship between facial expression and experience. Three studies that were unrelated to Laird also supported the relationship: Kleinke and Walton (1982); MacArther, Solomon, and Jaffee (1980); Rhodewalt and Comer (1979).

These studies have shown that facial expression may influence the experience of emotion without cognitive interpretation of such facial expressions. The methodology used in these studies involves giving participants a plausible excuse, most often an electromyography recording, and then asking them to contract and relax different muscles. At times the pattern of muscles were chosen to create an emotional expression. Laird (1984b) highlighted the importance of deception in this design to avoid cognitive interference. Participants were asked to report their emotional experiences in relation to a given stimulus. Results indicated that irrespective of the stimulus, participants whose faces reflected positive emotional expressions rated the stimulus higher than those whose faces reflected a negative-emotional expression. Laird concluded that, given that facial expression was produced without conscious cognitions associated with emotion, the resulting changes to emotional experience were related to facial feedback.

The effect of facial feedback has also been supported by similar experimental designs. Strack, Martin and Streeper (1988) conducted a similar study in which facial muscles were manipulated by asking participants to hold a pen within their lips or teeth. Participants were not informed as to the emotional label of the expressions they were

being asked to indirectly express. Participants were then asked to judge the funniness of cartoons. In accordance with earlier results (Laird & Crosby, 1974; Laird, 1984b), participants whose facial expression resembled a smile rated the cartoons as funnier than those participants whose facial expression resembled a frown.

In another design (Colby, Lanzetta, & Kleck, 1977; Lanzetta, Cartwright-Smith, & Kleck, 1976) participants were asked to either exaggerate or inhibit their facial expressions, usually to deceive an observer. This was done while being exposed to emotional stimuli, such as being administered an electric shock or watching a film. The results of these studies were that the magnifying of facial expression not only affected the reported experience of emotion, but also the autonomic responses of the participant. Replications of this study also supported the association (Kopel & Arkowitz, 1974; Kraut, 1982; Zuckerman, Klorman, & Spiegel, 1981) although one study failed to support the hypothesis (McCaul, Holmes, & Solomon, 1982).

While facial feedback studies have supported the possibility that facial expression may effect the experience of emotion, they have not precluded cognitive mediation. It has been assumed in such studies that participants did not realise that their facial expression resembled those of smiling or frowning, but no data to support this assumption was gathered (Colby et al., 1977; Lanzetta et al., 1976). Furthermore, given the artificiality of the experimental designs, the results do not provide any information as to the likelihood of such facial feedback during day to day human functioning.

Just as Schachter and Singer (1962) were able to demonstrate the effect of autonomic changes on the experience of emotion, Facial Feedback Theory has indicated that facial expression may also influence the experience of emotion. While emotional experience has been demonstrated to be the result of the interaction between autonomic change and cognitive factors, changes to facial expression has been shown to influence emotion even in the absence of cognitive interference. Furthermore while autonomic changes have been considered to be the undifferentiated basis of emotion (Schatcher, 1970), facial expressions have been more often associated with discrete emotions (Ekman, 1973; Izard, 1977). Therefore while changes to facial expression have been associated with specific emotional experience, changes to autonomic activity have been associated with general emotional change.

1.3.3. The Interaction of Facial Feedback and Autonomic Feedback Theories

Autonomic arousal has been demonstrated to effect the experience of emotion (Kimble, 1990; Krohne, 1986; Maslach, 1979; Reisenzein, 1983; Schachter & Singer, 1962; Schatcher, 1970; Von Holst & Von Saint Paul, 1970; Zillman & Bryant, 1974). Similarly facial expression has also been demonstrated to effect the experience of emotion (Duncan & Laird, 1980; Duncan, 1977; Edelman, 1984; Kellerman & Laird, 1982; Kleinke & Walton, 1982; Laird, 1984b; Laird & Crosby, 1974; Laird et al., 1982; MacArther et al., 1980; Rhodewalt & Comer, 1979; Strack et al., 1988). However, no experimental study has been identified that examined both effects of autonomic arousal

and facial expression. As such, the interaction effects of the two components of somatic change is unclear.

Autonomic activity has been examined as a dependant measure of facial expression experiences. When autonomic activity has been measured in conjunction with facial expression, autonomic activity has been found to predict specific emotions (Ekman et al., 1983; Levenson et al., 1991; Levenson, Ekman, & Friesen, 1990). Scientists and professional actors were asked to express six emotions: surprise, disgust, sadness, anger, fear and happiness. This was done in two conditions: (1) by recalling a memory that they associated with the emotion and (2) by following instructions about how to arrange their expression. Five physiological measures were taken during the procedure: GSR, heart rate, forearm muscle tension, left hand temperature and right hand temperature. In both conditions changes to the autonomic nervous system were produced. Ekman et al. (1983) also observed that there were reliable differences in mean finger temperature and heart rate between different facial expressions of emotions. Heart rate increased more for anger and fear than it did for happiness. Finger temperature increased more in anger than in happiness. Subsequent research has replicated these results (Levenson et al., 1991; Levenson et al., 1990).

Studies by Ekman et al. (1983) found distinct patterns of autonomic nervous system arousal for emotional experiences when such arousal was associated with distinct patterns of facial expression. When participants followed orders and mechanically moved facial muscles, they equally experienced the emotion and their autonomic nervous systems were more aroused. Such results are consistent with the

previous findings in relation to facial feedback (Laird & Crosby, 1974; Laird, 1984b) but Ekman et al. also found the autonomic nervous system arousal could also be differentiated by type of emotion. Fear, anger and sadness were associated with higher heart rates than disgust or happiness and anger was associated with higher finger temperatures than fear. Such results are contrary to the undifferentiated autonomic nervous system model of emotion presented by Schachter and Singer (1962). However, such results may have been the result of a common association of autonomic change and emotional experience with facial expression, rather than autonomic changes differentiating between emotions directly.

1.3.4. The Mechanisms of Somatic Feedback

Both facial feedback (Duncan & Laird, 1980; Duncan, 1977; Edelman, 1984; Kellerman & Laird, 1982; Kleinke & Walton, 1982; Laird, 1984b; Laird & Crosby, 1974; Laird et al., 1982; MacArther et al., 1980; Rhodewalt & Comer, 1979; Strack et al., 1988) and autonomic feedback (Kimble, 1990; Krohne, 1986; Maslach, 1979; Reisenzein, 1983; Schachter & Singer, 1962; Schatcher, 1970; Von Holst & Von Saint Paul, 1970; Zillman & Bryant, 1974) literatures have tended to support a relationship between such somatic changes and emotional experience. There have, however, been numerous discrepant models of the mechanism of the relationship (for example, Fridja et al., 1989; Izard, 1977; Laird, 1984b; Tomkins, 1963; Zajonc, Murphy, & Inglehart, 1989). Studies of the relationship between somatic cues and emotional experience have tended to be plagued by the black box dilemma: while it is evident that changes to

somatic cues are associated with changes to emotional experience, it is unclear what is the mechanism of this association.

Early theories of the association of somatic change and the experience of emotion did not explicate the mechanism of such a relationship. James (1884) did not provide a detailed model of how behaviour subsequently causes the experience of emotion (Lang, 1994). Subsequent theories as to the mechanism of the association of somatic change and emotional experience may be divided into three types. The first examines physical mechanisms by which somatic changes may be relayed to the central nervous system. The second possible mechanism of the association of somatic change and the experience of emotion is the receptors in the muscles and skin. The third type of model refects cognitive mechanisms by which somatic changes may be perceived.

The experience of emotion may be elicited by the stimulation of those parts of the central nervous system associated with somatic changes. According to some theorists, the experience of emotion is elicited through felt action tendencies (Arnold, 1960; 1970; Fridja, 1970; 1987; Fridja et al., 1989) that are experienced when parts of the brain are stimulated. Action tendencies are defined to be a type of action readiness that involves engaging with the object of an emotion. Other forms of action readiness may also be associated with emotion such as inhibition, general exuberance or helplessness. Fridja et al. (1989) proposed a list of 17 modes of action readiness. According to Arnold (1970) once an action tendency is neurologically stimulated, feedback to the cortex results in emotional experience. Fridja's account of the

association of experience and action tendency is less clear, referring to an awareness of action tendencies in the participant.

Studies of action tendency have used a similar methodology to that of studies of the direct association of appraisal and emotional experience. Fridja et al. (1989) asked participants to complete a questionnaire on one of 32 emotional states. Participants were asked to recall an experience of that emotion and rate both appraisal dimensions and action readiness. The results indicated that the appraisal of a situation related directly to the way in which participants tended to act. With the exception of blushing (R^2=*.1*) subjective identification of action tendencies correlated with the subjective identification of dimensions of appraisal (range of R^2 =*.45* to R^2 =*.97*). While the linking of appraisal with action tendencies seems to provide a useful model, there are a number of criticisms of the methodology of studies used to test both pure appraisal and action tendency models of emotion. It is questionable whether the process of appraisal during recalled events is indicative of the process of appraisal in normal daily life. It is not even clear that in real life appraisal is conscious and yet the methodology relies on conscious appraisal.

The experience of emotion has also been associated with other physical structures. Israel Waynbaum (1907, as cited Zajonc et al., 1989) proposed a physical link between somatic change and emotional experience. Facial muscular movement, by its effect on the cavernous sinus, may restrict venous flow and thereby induce cooling of the arterial blood supply to the brain. It was argued that an experience being perceived as positive was related to the pleasurable effect of the cool air. This model

has again been espoused more recently (Zajonc, 1980; 1984; 1985; Zajonc & Markus, 1984; Zajonc et al., 1989). In order to test the relationship of changes in the temperature of venous blood flow and emotional experience, Zajonc et al. (1989) asked 26 German speaking participants to read one of two stories. In the experimental condition participants read a story containing the vowel "ü". Participants read a story without the vowel "ü" in the control condition. It was reasoned that pronunciation of the vowel "ü" requires vigorous action of the muscles around the mouth and contraction of the nostrils, restricting airflow to cool veins draining into the cavernous sinus. Participants were asked to rate the stories on a scale of how much they liked the story. Results indicated that the stories containing the vowel "ü" were rated as being liked significantly less. Furthermore the two conditions produced different thermographic recordings. A thermographic is a type of thermometer that produces a continuous record of temperature. The mean rise in temperature for the vowel "ü" condition was +0.30 C as compared to just +0.02 C for the non-vowel condition.

Differential Emotions Theory models the facial feedback to be dependent on receptors in the muscles and skin (Izard, 1977; Tomkins, 1963). These receptors, which are similar to receptors located in the autonomic nervous system, led through specific neural pathways. This model has been termed the “Jamesian” model of feedback (Winton, 1986) even though James was not specific in terms of the mechanism of the association of somatic change and the experience of emotion (Lang, 1994). Indeed most emotion theory of somatic feedback assumes such feedback to occur through a process of perception (Schachter & Singer, 1962; Zajonc & Markus, 1984).

Whereas autonomic feedback theory emanated from the work of James, facial feedback theory was based on self-perception theory (Laird, 1984a). The central tenet of self-perception theory is that humans infer their own emotional state from observations of their own behaviour and the environmental context (Bem, 1967; 1972). The mechanism by which the experience of emotion is elicited is therefore similar to attribution made from others' behaviour about their state. Emotional experience is the product of making an attribution about one's own behaviour.

Most emotion theory of somatic feedback assumes such feedback to occur through a process of perception (Schachter & Singer, 1962; Schachter, 1966; 1970; Zajonc & Markus, 1984). The mechanism of autonomic feedback has also been demonstrated to be a function, at least in part, of perception. Valins (1966) demonstrated that it was not somatic changes that led to emotional experience but rather the perception of somatic changes. Unlike Schachter, Valins did not manipulate autonomic arousal, but rather the participant's perception of his or her arousal. Participants were led to believe that their heart rates were being recorded by an archaic appearing piece of equipment. They were instructed to ignore the sounds from the equipment and attend to the slides that consisted of nude models. The sounds from the equipment were pre-recorded heartbeats and independent of participants' actual heartbeat. Valins found participants more likely to rate the slides as more appealing when accompanied by a variation in the rate of pre-recorded heartbeat.

In summary, subsequent research has supported the findings of Schachter and Singer (1962) that somatic changes can influence the experience of emotion. Both

autonomic changes and facial expression have been implicated as contributing to a somatic factor. It remains unclear as to the relative importance of the physical and perceptual association of somatic changes with the experience of emotion and it seems probable that somatic feedback may occur via either channel. Laird terms this Dual Afferent Mediation (Laird, 1984a; Winton, 1986). What is clear is that somatic change may relate to the experience of emotion. This relationship, and the focus of this study, has been called emotional-congruence.

1.3.5. Somatic Emotional States

It has been discussed that somatic changes may influence the experience of emotion. This has been demonstrated by directly modifying autonomic states with the use of chemical injections (Reisenzein, 1983; Schachter & Singer, 1962), indirectly exposing participants to situations that evoke arousal (Adler & Carey, 1980), manipulating facial expression and asking subjects to exaggerate their own facial expression (Duncan & Laird, 1980; Duncan, 1977; Edelman, 1984; Kellerman & Laird, 1982; Laird & Crosby, 1974; Laird et al., 1982; Laird, 1984b) and asking subjects to exaggerate their own facial expression (Colby et al., 1977; Lanzetta et al., 1976). All such studies support the view that emotion may be predicably experienced in the presence of somatic changes.

The proposition that somatic change may be associated with the experience of emotion does not, however, infer that the experience of emotion is invariably congruent with somatic changes. One of the reasons for emphasising the component approach to

emotions has been because only a small proportion of the variance of components is shared (Lang, 1993). Some emotions that may be powerfully experienced, such as sadness or shame, may either be associated with minimal somatic change (Ekman et al., 1983; Levenson et al., 1990) or may not be associated with autonomic change at all (Lazarus, 1991) (see Section 1.3.3).

An example of the experience of emotion without somatic change is when the expression of emotion is deliberately masked or suppressed by that person (Gross & Levenson, 1993). When facial expressions are suppressed, facial expression is incongruent with the experience of emotion and probably autonomic arousal. While suppression affects the association between expression and experience as well as expression and physiological changes, it is less likely to effect the relationship between physiological change and experience (Cacioppo et al., 1992). The suppression of emotion has been observed in children (Saarni, 1979) in some cases as early as three and four years of age (Harris, 1989).

Suppression is not, however, the only cause of emotional incongruence. A range of factors may lead to the experience of emotion being incongruent with somatic changes. Overstimulation may also lead to incongruence (Cacioppo et al., 1992). Whereas emotions are associated with particular actions such as flight for fear and fight for anger (Arnold, 1970; Fridja et al., 1989), such action tendencies may be inhibited in the presence of strong emotion. Emotions have been described as an action tendency in that the presence of an emotion makes certain actions or behaviours more probable. This phenomenon may be seen where people freeze in fear (Cacioppo et al., 1992).

This has been argued to be a method of coping with such strong emotions (Cacioppo et al., 1992; Krohne et al., 1992).

Thus far three factors have been discussed that impact on the association of somatic change and the experience of emotion: the emotion type, the strength of the stimulation and the use suppression. While some emotion types are usually associated with somatic change, such somatic changes do not always occur. Furthermore this absence of somatic change is not always related to suppression or overstimulation.

With the development of cognitive structures, humans have an increasing capacity for the experience of emotion with or without somatic changes (Harris & Katkin, 1975). Emotions, and consequently the experience of emotions, may be understood within a cognitive framework (Bower, 1981; Lazarus, 1984; 1991; Ortony & Turner, 1990). In such a framework the distinction between emotion with or without somatic change may be the distinction between what Lazarus (1981) referred to as hot and cold cognitions. The validity of conceptualising the emotional system as a function of the cognitive system has been debated (Lazarus, 1981; Zajonc, 1980; 1984; Zajonc & Markus, 1984). It is clear, however, that with the development of cognitive structures, the experience of emotion may be elicited independently of somatic change.

The experience of emotion has been divided into two types based upon the relative influence of somatic and cognitive factors. Much of the theory has come from the study of fear and anxiety. There has been significant variation in the terminology used for the experience of emotion associated with somatic factors (see Table 1).

Some individuals are more likely to experience somatic anxiety than cognitive anxiety and vice versa. For example, historically there has been a tendency in clinic populations to focus on either somatic or cognitive symptoms of anxiety (Buss, 1962; Hamilton, 1959). The distinction of cognitive and somatic anxiety has also been found in non-clinical populations. Barret (1972) analysed the responses of a non-clinical population to anxiety items from a large battery of commonly used scales and found two factors. Barret (1972, pp. 202) reported that the results indicated:

> … two major subsets: (1) awareness of somatic changes, for example, I blush often or I am often aware of my heart beating; (2) conscious awareness of unpleasant feelings about self or external stimuli, for example I frequently worry about something.

Similar studies (Fenz & Epstein, 1965; O'Connor et al., 1956) have identified similar factors for the Manifest Anxiety Scale.

Table 1

Terminology Used by Different Authors for Cognitive and Somatic Factors of Anxiety.

Author	Cognitive Factor	Somatic Factor
Krohne (1978)	experience of uncertainty	perception of bodily arousal
Shalling, Croholm and Asberg (1975)	psychic anxiety	somatic anxiety
Morris and Liebert (1970)	worry	emotionality
Breznitz (1984)	fear of danger	fear of fear

The distinction between cognitive and somatic factors (Morris & Liebert, 1970) demonstrates the utility of the cognitive somatic distinction in the study of emotional states. In a study of the relationship between anxiety and expectations of test performance, Morris and Liebert (1970) constructed criteria for two distinguished forms of anxiety: worry and emotionality. Both measures related to the experience of anxiety, but while worry related to the cognitive concern about the consequences of performance, emotionality was the perception of autonomic reactions. The results supported the distinction, while worry was found to have been inversely related to expected performance, no relationship was found between emotionality and expectancy.

The distinction of two forms of anxiety continued to be supported within other populations. Numerous writers have observed that there are different symptoms of each form of anxiety that may be identified (Fox & Houston, 1983; Schwartz, Davidson, & Goleman, 1978; Shalling et al., 1975). It has been observed that "… cognitive anxiety

generally refers to worrisome, preoccupying thoughts about self or external stimuli, whereas somatic anxiety generally refers to bodily or physiological processes or sensations" (Fox & Houston, 1983, pp. 862).

The unique variance explained by somatic and cognitive anxiety was shown even in children. In a study of children's experience of anxiety, Fox and Houston (1983) suggested that of the 20 items on the STAI-C (Speilberger, Edwards, Lushene, Montuori, & Platzek, 1973), trait sub-scale, 15 reflected cognitive anxiety, three reflected somatic anxiety and two did not reflect either. The scale was modified removing the two items that did not reflect either cognitive or somatic anxiety and by adding six items reflecting somatic anxiety. The correlation between the two scales was found to be .62 ($p < .001$) indicating some overlap between the scales. While there was a little over a third of variance shared between the scales, it also indicated considerable unique variance for each scale as well. The distinction of the symptoms of cognitive and somatic anxiety lead to the development of the Cognitive Somatic Anxiety Questionnaire (Schwartz et al., 1978). This was an anxiety inventory in which the two forms of anxiety were differentiated.

The assertion that somatic changes may affect the experience of emotion may not assume a simple model. Cognitive as well as somatic factors may influence the experience of emotion and the relative influence of each may vary by participant and condition. The type of somatic change may include a range of changes including both autonomic change and facial expression, and such changes may influence the experience of emotion through a range of mechanisms. While such a model is complex

with numerous variables, the current theory and experimental evidence would indicate that such somatic changes might influence the experience of emotion. Such an assertion does not imply the experience of emotion is always exclusively determined by somatic changes.

1.4. Individual Differences in the Relative Congruence of Somatic Changes and Emotional Experience

Individuals differ in the relative salience of components of emotion. This has been supported by clinical experience of anxiety (Buss, 1962; Hamilton, 1959), test performance (Morris & Liebert, 1970) and the results of factor analysing the standard self-report measures (Barret, 1972; Fenz & Epstein, 1965; O'Connor et al., 1956). It has also been proposed that individuals reliably differ in terms of their predominant mode of experienced anxiety:

> When anxiety is elicited in an individual in response to a stressful event, the quality of feelings aroused in one situation may be different than in another. In addition, some people may experience anxiety in one predominant mode, while others may become anxious in a different manner.
>
> (Schwartz et al., 1978, pp.321-322)

Whereas one individual may tend to experience thoughts associated with an emotion, another may focus on the somatic changes associated with that emotion. The

experience of emotion for some individuals may therefore have a greater association with somatic changes.

Individual differences in the relative salience of somatic and cognitive factors will be discussed in the context of two theoretical models: the Semantic Network Model (Bower, 1981; Bower & Cohen, 1982; Gilligan & Bower, 1984) and the Hierarchical Models of Emotion. The Hierarchical Models of Emotion includes Lacey's Model of Response Stereotypy (Lacey, 1959; 1967; Lacey et al., 1963; Lacey & Lacey, 1958; 1962). In relation to the Semantic Network Model, studies have found that there are differences in the architecture of associative links to differences in the association of somatic change and the experience of emotion in relation to both facial expression (Laird, 1984a; Laird, 1984b; Laird et al., 1982) and autonomic arousal (Egloff & Krohne, 1996; Krohne, 1978; 1986; Krohne et al., 1992). The Hierarchical Model of Emotion includes Lacey's model of Response Stereotypy (Lacey, 1959; 1967; Lacey et al., 1963; Lacey & Lacey, 1958; 1962). This model indicates that both cognitive and somatic changes compete as cues for attention. As such individuals may tend to focus on one cue more frequently than another.

1.4.1. A Network Model of the Association of Somatic Change and The Experience of Emotion

Central to this study was the question of the role of individual differences in the association of somatic change and the experience of emotion. The number of components, the association of components and the mechanisms of feedback between

components form a complex system. The Semantic Network Model (Bower, 1981; Bower & Cohen, 1982) is a theoretical model of emotion. In order to examine the question of the role of individual differences in the association of somatic change and the experience of emotion, this model will be examined to explore how individuals may differ in the relative congruence of somatic change and the experience of an emotion.

The Semantic Network Model was constructed to explain how emotions (or moods) might influence cognitive processes such as learning, memory, perception and judgements. A series of experimental studies involving hypnotised participants (Bower, 1981; Bower & Cohen, 1982) found that emotion affected the type of memory recalled, the learning of material and other cognitive processes such as interpretations, fantasies and social judgements. For example, when participants were induced into a sad state they recalled more items associated with a sad vignette and fewer items associated with a happy vignette. Conversely when participants were induced into happy state they recalled more items associated with a happy vignette and less items associated with a sad vignette.

The Semantic Network Model was an extension of the Propositional Network Theory (Anderson, 1983; Anderson & Bower, 1973) to explain such findings. This earlier theory holds that memory is made up of propositions: small units of simple meaning. The separate small units of meaning may be associated in memory to create more complex meanings. Visual images and sounds have also been demonstrated to be associated within memory (Anderson, 1983) and linked to propositional networks

(Anderson, 1983). Memory is therefore considered to be a series of propositional nodes and stems that associate nodes.

Memories associated with emotion are also made up of descriptive propositions termed nodes (Bower, 1981; Bower & Cohen, 1982). Three significant differences between Proposition Network Theory and The Semantic Network Model (Bower, 1981; Bower & Cohen, 1982) may be identified. First, Bower includes specific emotion as nodes within his model. Emotion nodes differ from other nodes in the range and intensity of excitation to other nodes in associated systems. Bower and Cohen (1982) compare such excitation to an electrical current, describing emotion nodes to have a greater voltage than is the case for other nodes. This postulate is made in order to explain the attention orientating effect of emotion. Emotion nodes are a latent prototype of emotion rather than a specific experience or somatic change.

A second difference between Proposition Network Theory and The Semantic Network Model is the inclusion of somatic components. Bower includes both expressive behaviours and autonomic patterns as components or nodes. The inclusion of somatic changes within a framework of emotion reflects the association of emotion with somatic changes. Other versions of network theory (Lang, 1977; 1979; 1993; Strongman, 1987) have also been used to explain how emotion and somatic change are associated. The Bio-Informational Model (Lang, 1977; 1978; 1979; 1993), a version of network theory applied to systematic desensitisation techniques, defined three types of nodes: stimulus nodes, response nodes and meaning nodes. Stimulus nodes are representations of environmental events that may stimulate an emotion. Response

nodes are not the idea or verbalisation of running, walking, playing or shouting, but rather the actual motor programs for carrying out these events (Lang, 1979; 1993). Similarly nodes within The Semantic Network Model of Emotion include motor programs rather than the idea of such somatic changes.

The third difference between Proposition Network Theory and The Semantic Network Model is the inclusion of experiential components of emotion. Bower refers to such nodes as concept nodes which, if stimulated beyond a specific threshold, are brought into consciousness. Lang (1979) uses the term meaning node in a similar manner. Meaning nodes, which can be roughly equated to emotional experience, may be connected to either stimulus nodes or response nodes. Associative stems connect nodes to each other.

1.4.2. The Salience of Somatic Nodes

The Semantic Network Model (Bower, 1981; Bower & Cohen, 1982) predicts that the experience of emotion and the recall of information associated with an emotion are strongly linked. This was supported by a study in which people's facial expressions were manipulated while they read vignettes with an emotional theme. It was found that if the participants facial expression matched the emotion thematically contained in the vignette, their recall of information within that vignette was more accurate. These results were interpreted to indicate that cognitive structures associated with facial expression were the same as those associated with memory. As such there was more

accurate recall of the content of the stimulus context where such content was congruent with facial expression.

This model may be used to explain variance of the association of somatic changes with the experience of emotion between individuals. Individual differences have been found in the association of facial expression and related cognitive structures (Laird, 1984a; Laird & Crosby, 1974). In another study (Laird & Crosby, 1974) the level of emotional experience felt was compared to the level of emotionally relevant information retained during a procedure. Participants' facial expressions were again manipulated during this study. During these times participants were asked to rate their experience of emotion. Following the measurement of participants' experience of emotion, all participants were assigned to one of two groups. Participants with congruent emotional experience and facial expression were classified as responsive to self-produced cues. The second groups consisted of participants with low congruence of the two measures.

The results of this study indicated that there was an association of memory and facial expression (Laird, 1984a; Laird & Crosby, 1974). As before there was more accurate recall of the content of the stimulus context where such content was congruent with facial expression. It was further found however that participants, who were responsive to self-produced cues, were also more likely than others to remember information that was emotionally congruent when their facial expressions again were manipulated.

Two observations may be made from the results (Laird, 1984a; Laird & Crosby, 1974). First, results indicated that when facial expression was congruent with the content of sentences, the recall of the content was more accurate for all participants. This finding was consistent with the earlier findings (Bower, 1981; Bower & Cohen, 1982). Secondly, this effect was significantly magnified for participants who were classified as responsive to self produced cues. As such individual differences in the salience of the association of the experience of emotion and changes to facial expression were demonstrated by Laird et al. (1982). Such results were consistent with a network model of emotion. Participants who experienced emotion more intensely when their facial expression was manipulated may be assumed to have a greater complexity of associations between somatic nodes and experiential nodes. Similarly when participants were asked to recall emotionally relevant information, participants who had connections between that information and somatic changes were more able to recall that information when their facial expression was congruent.

The Semantic Network Model may be equally applied to the association of autonomic activity with the experience of emotion as to the association of facial expressivity with the experience of emotion. It would therefore be expected that some people would be more sensitive to cues that are self produced from autonomic changes. This expectation was supported by a study in which participants were exposed to an aversive tone of 100 decibels for five minutes (Krohne et al., 1992). Participants were unaware of the exact moment of the tone over the four trails. It was found that the two groups predicted the relationship of subjective anxiety to somatic changes. Heart rate

and GSR explained 33% of the variance of subjective anxiety for the first group. This compared to heart rate and GSR explaining 19% of the variance for second group.

It may have been expected that the association of somatic change and the experience of emotion divided the two groups in the study (Krohne, 1978; Krohne et al., 1992). The association of somatic changes and experience was not, however, used to divide the two groups. The research was specifically aimed at the role of coping mechanisms in emotion and it was a coping style that was used to divide the groups. In a series of studies, such coping mechanisms were compared to features of the associative network and the salience of somatic change in the experience of emotion. Specifically, the study examined a group of people who were characterised by the vigilant intake and processing of information associated with emotion, including their own somatic changes without avoiding threat related stimuli associated with increased somatic change. This group were labelled sensitisers. Two coping style types delineated sensitisers. The first type, cognitive avoidance or repression was characterised by a low tolerance for somatic arousal. Such individuals attempted to reduce their somatic emotion by reducing their attention to the threatening stimulus. The second type was called vigilance. Vigilant people were affected by uncertainty and coped with anxiety by increasing their attention to the stimulus in order to decrease ambiguity. As outlined in Figure 1, these two coping mechanisms were described as independent.

	High Vigilance		
Low Cognitive	*Sensitisers*	*Truly High Anxiety*	*High Cognitive*
Avoidance	*Low Anxiety*	*Repressers*	*Avoidance*
	Low Vigilance		

Figure 1. Based upon the model of Krohne et al. (1992), sensitisers are defined to be the interaction of low cognitive avoidance and high vigilance.

Vigilant individuals seem to have a lower perceptual threshold for internal body stimuli (Krohne, 1978; 1986; Krohne et al., 1992; Miller, Combs, & Kruus, 1992). The tendency to use vigilant styles of coping with anxiety is a personality trait (Byrne, 1964; Erikson, 1966). Given that the use of vigilant styles of coping is associated with a greater association of somatic change and the experience of emotion, it may be expected that individuals who reliably use such coping strategies will also have a greater association of somatic and experiential components of emotion.

The study also examined the coping style of avoiding anxiety. The tendency to use vigilance and cognitive avoidance were treated as separate strategies. Participants potentially could therefore be rated as using either, both or neither strategy. Subsequent research has indicated that the two coping styles are independent (Hock, Krohne, & Kaiser, 1996). The results indicated that the use of avoidance was unrelated to the association of somatic changes and the experience of anxiety. Krohne et al. (1992) stated "… it appears that the avoider's anxiety experience is not dependent on how

intensely they are somatically aroused..." (p.89). As such the association of somatic change and the experience of emotion was distinguished by vigilance only.

Individuals who are classed as sensitisers have a greater association between the experience of emotion and somatic changes (Egloff & Krohne, 1996; Krohne, 1978; Krohne et al., 1992), not just those who are highly anxious. This is consistent with the assertion that such individuals have a cognitive network that is highly differentiated and interconnected with a multitude of elements and associative linkages (Krohne et al., 1992). It may be expected that greater association between the experience of emotion and somatic changes in practice is associated with a greater association between the nodes representing the experience of emotion and the nodes representing somatic changes.

1.4.3. Differentiation of Cognitive and Somatic Emotion

The Semantic Network Model of Emotion is a useful model of cognitive structures of emotion. Three features of the model are relevant to the current study. First, the model incorporates the experience of emotion. This experience may or may not be associated with somatic symptoms. As such the model provides a framework for understanding the interaction of somatic change and experience of emotion.

Secondly, the model is consistent with current emotion theory. There is substantial evidence that there are significant innate aspects of emotion (Izard, 1993; Tomkins, 1963) and that emotion types are associated with unique patterns of facial

expression as well as autonomic change (Ekman et al., 1983; Levenson et al., 1991; Levenson et al., 1990). Such assumptions may easily be included with little departure from Bower's model. Within such a model these assumptions are consistent with learnt associations and individual variation (Izard, 1993).

Thirdly, The Semantic Network Model (Bower, 1981; Bower & Cohen, 1982; Gilligan & Bower, 1984) explains individual variation in the interaction of components of emotion. It may be expected individuals may associate emotion with different patterns of somatic change. The Semantic Network Model of Emotion provides a powerful model of the association of the components of emotion because it provides a model of individual differences in the salience of components without making assumptions about which associations are innate or learnt. The evidence that the association between experiential nodes and somatic nodes may be learnt supports the possibility of individual differences in the strength of such associations. As such the model may predict that some individuals have a greater association of the experience of emotion and somatic changes.

In summary, the emphasis of the discussion of The Semantic Network Model of Emotion has been that the model is consistent with observations of emotion (Egloff & Krohne, 1996; Izard, 1990; Krohne et al., 1992) as well as other theories of emotion (Izard, 1993; Lang, 1993). The consistency of The Semantic Network Model of Emotion with other observations and theories does not demonstrate the validity of the model. Individual networks of emotion cannot be directly observed. The Semantic

Network Model of Emotion does, however, provide a set of common terms and assumptions so that commonalities of such theories and observations may be compared.

1.4.4. A Hierarchical Model of the Association of Somatic Change and the Experience Of Emotion

An alternative model of emotion to The Semantic Network Model of Emotion is to conceptualise emotion as a list of symptoms, both cognitive and somatic, that may be ranked in order of salience for an individual. Emotion is commonly modelled as a series of components with each component being comprised a subordinate set of components (see Section 1.1). Somatic changes, for example, include facial expression and autonomic changes. Autonomic changes include changes to the breath rate, pupil dilation and GSR. At each level of component differentiation an individual may have a greater emphasis on one component than another. An individual may have a greater association of experience and breath rate than dilation or greater association of experience and facial expression than autonomic change. Components of emotion, on a range of levels, may therefore be differentiated in terms of their association with the experience of emotion.

Early psychiatric observations indicated the differentiated salience of individual somatic components such as heart rate and muscular changes in the forehead region (Malmo, 1959; Malmo & Shagrass; 1949). It was reported that psychiatric patients who frequently complained of headaches had low reaction threshold to stress of the muscles in the forehead region (Malmo & Shagrass, 1949). Patients who complained of heart

palpitations showed low reaction threshold of heart rate and heart rate variability (that is, a low threshold for change). Such observations of psychiatric patients were not aimed at directly addressing the question of the role of individual differences in the congruence of somatic changes and the experience of emotion. As such, some limitations needs to be applied in using these observations in making assertions about the role of somatic change in the experience of emotion. The observations were of patients who experienced health symptoms, and while psychosomatic complaints may be closely associated with emotional responses, it was not the patient's experience of emotion that was reported. Furthermore this early work was anecdotal and there was no attempt made to compare, either within somatic changes or between somatic changes, and the patient's experience.

The two salient somatic changes identified in such early literature (Malmo, 1959; Malmo & Shagrass; 1949) as differentiating the two groups of patients were a low reaction threshold to stress of the muscles in their forehead region, and the low reaction threshold and variability of their heart rate. The categorical distinction between salient autonomic changes and salient changes to facial expression has been subsequently supported (Lacey, 1959; 1967; Lacey et al., 1963; Lacey & Lacey, 1958; 1962; Lang, 1979). Reliable individual differences have also been observed in the threshold of response of facial expression and autonomic activity for some individuals. It has also been found that some people who displayed significant GSR changes, reliably are less likely to respond with the associated facial expressions as compared with those who are less responsive in terms of GSR (Buck, 1980; Jones, 1960; Prideaux,

1920). The results of these studies do not show GSR is inversely related to facial expression. For most participants in all studies, GSR and facial expression were related. What was a significant result was that for some participants these two components were not related and that such organisation was consistent over time.

Such findings (Buck, 1980; Jones, 1960; Malmo, 1959; 1949; Prideaux, 1920) may be applied to emotional-congruence. The results of such an application indicate that not only do somatic changes lead to the experience of emotion, but that certain components of somatic change are more salient for certain individuals. A range of somatic components of emotion has been identified including autonomic changes (such as skin conductance, blood pressure and heart rate) and muscular changes (such as to facial expression). The observation of Malmo and Shagrass (1949) may indicate that, for the patients identified, muscular change was a salient component of their experience of emotion.

Other studies have compared expressivity and autonomic change (Alexander, 1950; Jones, 1960). Results indicated that some people tended to have high emotional expression and low autonomic change while others tend to have high autonomic change and low facial expressivity. Individuals who displayed emotional expressions, but had low autonomic change were called externalisers. Conversely individuals with high autonomic reactivity but low levels of facial expression were called internalisers (Alexander, 1950; Cacioppo et al., 1992; Jones, 1960). This was based on an assumption that emotion needed to be discharged and so the blocking of one outlet would increase the changes to the other. As such this theory became known as

Emotional Discharge Theory (Alexander, 1950). This theory has been criticised (Cacioppo et al., 1992) on the basis that it emphasises the role of inhibiting emotional expression at any one time and not the traits of the individual that may lead to variation in somatic changes (Cacioppo, Martzke, Petty, & Tassinary, 1988; Cacioppo et al., 1992).

Individual differences were found in the relationship between autonomic activity and emotional experience by Lang (1993). Lang exposed participants to 21 emotionally evocative pictures. Such pictures included happy babies, mutilations, erotic interactions and frightening animals. Throughout this procedure facial expression, autonomic activity and the experience of emotion were measured. Two results were indicated. First, pictures that elicited the greatest physiological reaction were also more likely to elicit the greatest experiential reaction for the whole sample. Secondly, Lang found that, for some participants, the experience of emotion had a greater association with facial expression, while for others the experience of emotion had a greater association with autonomic activity.

The individual differences in the association of the experience of emotion with facial expression and autonomic changes were consistent with the findings of Lacey and Lacey's (1958) classic study. Participants were exposed to four conditions that were anticipated to elicit an emotional response. These conditions included anticipation of a cold pressor, cold pressor test, mental arithmetic and a word fluency test. Physiological activity was measured throughout the procedure. These measures included systolic and diastolic blood pressure, skin conductance, heart rate, heart rate variability and pulse

pressure. Participants were then rank ordered on each of the five measures of autonomic arousal over each of the four conditions. It was found that there was great variation of the rank of participants across different measures. The rank of participants on each measure was, however, relatively consistent across conditions. Lacey then ordered measures of autonomic activity on the basis of participant rankings. This ordered list of measures of autonomic activity was called the individual response hierarchy.

Lacey found that patterns of responses were consistent across conditions. That is to say, if a participant's skin conductance was high and their heart rate was low compared to other participants, this was found to be consistent across conditions. Lacey called the variance within somatic changes that was attributable to the person or person-situation interaction individual response stereotypy. The finding that such variance is explained by individual response stereotypy has been supported by subsequent research (Cacioppo et al., 1992). Individual response stereotypy has also been applied to facial expressions and gross motor behaviour as well as autonomic activity (Cacioppo et al., 1992). The construct of individual response stereotypy has tended to be supported by research, however, as with many personality traits, it also evident that situational determinants may also influence response hierarchies (Fahrenberg, Foester, Schneider, Muller, & Myrtek, 1986; Foerster, 1985). As such individual response stereotypy has tended to be more consistent when the situation is constant (Foerster, 1985; Myrtek, 1984).

The findings of Lang (1993) and Lacey et al. (Lacey, 1959; 1967; Lacey et al., 1963; Lacey & Lacey, 1958; 1962) were consistent. Lang found individuals might tend to have a greater congruence of their experience of emotion with either facial expression or autonomic changes. This is consistent with Lacey's finding that individuals may tend to have a greater congruence of their experience of emotion with different components of autonomic change. Thus individual differences in the salience of components within the subset of autonomic changes, and differences between autonomic and muscular changes, may be incorporated in a single model.

Environmentally produced cues may also be included in a Hierarchical Model of competing cues. The assertion that self-produced somatic cues compete with environmentally produced cues has been supported by numerous studies (Pennebaker, 1982; Pennebaker & Brittingham, 1982). Individual variance in the tendency to have a greater congruence of the experience of emotion with somatic changes generally has also been indicated. Pennebaker (1982) asserts that as the number and salience of external cues increase, attention to internal cues will decrease and vice versa. For example, it has been found that joggers ran fast and reported less fatigue when exercising in an environment that demanded the runners attention (Pennebaker & Lighter, 1980). Furthermore, participants coughed less (Pennebaker, 1980), expressed less extreme emotions (Pennebaker, 1982) and were less aware of perceptions of fatigue (Pennebaker & Brittingham, 1982).

Research in related fields has tended to support the idea that somatic changes and cognitive processing of the environment compete to affect human experience. The

studies of Pennebaker and associates have tended to focus on the manipulation of the environment as a means of decreasing the effect of internal cues. Other studies have directly manipulated the participant's attentional style and found similar results. Fillingham and Fine (1986), for example, found that when participants were directed to attend to their heart rates and breathing rates they reported more physical problems such as side cramps and shortness of breath, than participants who listened to verbal stimuli. Similarly numerous studies have found that using a mirror while exercising, and thus increasing self-attention, also increased somatic problems (Duval & Wicklund, 1972; Wegner & Vallacher, 1980; Wicklund, 1975). Such studies into the comparative salience of somatic change and environmental cues tend to examine the relationship of components when elicited by physical exercise rather than emotion (Duval & Wicklund, 1972; Pennebaker, 1982; Pennebaker & Brittingham, 1982; Wegner & Vallacher, 1980; Wicklund, 1975). It is reasonable to question the validity of generalising a model relating to exercise to that of emotion.

A Hierarchical Model of emotion may be constructed from the work of Lacey, Lang and Pennebaker. Pennebaker (1982) found that the comparative influence of somatic and environmental cues on the experience of emotion varied dependent upon situational variables. Lang (1993) found that within the influence of somatic cues, the relative influence of facial affect and autonomic activity on the experience of emotion varied across individuals. Such findings are consistent with Lacey's (1959) model of Response Stereotypy. This model emphasises the difference in the salience of

particular components of emotion across individuals. This broader conceptualisation of Response Stereotypy was reflected in Lacey's later theory (Lacey, 1967).

It has been previously argued that somatic changes are not always congruent with the experience of emotion and that the incongruence of somatic factors and the experience of anxiety may occur for a number of reasons. Some of these reasons may be associated with particular emotions or suppression by the individual. Some discrete emotions, such as shame and sadness, are often considered not to be associated with autonomic changes. This may lead to the high experience of emotion but low autonomic arousal. At times an individual may suppress an expression of emotion. Suppression by an individual may create incongruence in that there is high emotional experience and probably high arousal, but low expression of emotion.

1.4.5. Comparison of the Network and Hierarchical Models of Emotion

With the development of cognitive structures, humans have an increasing capacity for the experience of emotion with or without somatic changes. The experience of emotion may be affected by whether somatic change is a salient component (Breznitz, 1984; Morris & Liebert, 1970; Shalling et al., 1975). Emotions, and consequently the experience of emotions, may be understood within a cognitive framework (Bower, 1981; Lazarus, 1981; 1991; Ortony & Turner, 1990) that includes representations of somatic components.

Two broad models of emotion have been discussed; the Network Model and the Hierarchical Model. These two models do not form two distinct models within the literature. Research and theory within the area of somatic emotion has not formed a homogeneous literature. The two models were created to emphasise a number of consistent themes within the literature. In particular, the research has tended to emphasise the association of components or the comparative salience of components. Such research was subsumed into the Network Model and the Hierarchical Model respectively.

Within the framework of a Network Model of emotion, a number of models and research findings have been discussed. Laird (1984a; 1984b) found that some individuals have a greater association of facial expression and experiential aspects of emotion. Similarly Krohne and colleagues (Egloff & Krohne, 1996; Krohne, 1978; 1986; Krohne et al., 1992) found that some individuals had a greater association of autonomic change and autonomic activity. Such findings were consistent with the theory of Lewis and colleagues (Brooks-Gunn & Lewis, 1976; Lewis & Michalson, 1983; Lewis, Sullivan, Stanger, & Weiss, 1989) that such associations were in part learnt in childhood.

The Hierarchical Model also distinguished the components of emotion. Within this framework a number of theories and observations were discussed that compared the salience of components of emotion. Numerous studies have identified that some individuals will reliably identify a component of emotion as salient (Alexander, 1950; Jones, 1960; Malmo, 1949). Lacey and colleagues (Lacey, 1959; 1967; Lacey et al.,

1963; Lacey & Lacey, 1958; 1962) demonstrated that the comparative salience of components are reliable over time and conditions. Within such a model somatic components may be less salient as compared to cognitive components.

The two models are not contradictory. Both models include somatic changes as a fundamental component. The outcome of the research associated with both models is that the influence of the somatic changes associated with the emotion is subject to variation dependent upon the individual. Whereas the Network Model emphasises individual differences in the absolute level of the association between experiential and somatic components, the Hierarchical Model emphasises the comparative level of association between components.

1.4.6. The Identification of Cognitive and Somatic Trait Anxiety

The research indicates that some individuals will have a greater congruence of emotional experience and somatic change. The method for identifying such individuals has been to measure directly the association of the two components (Laird, 1984a; Lang, 1993). There has been little research that has provided any criteria for identifying individuals for whom the experience of emotion and somatic change is likely to be congruent. Krohne et al. (1992) found that participants who used sensitiser coping mechanisms for stress tended to have a greater congruence of components, but this was not the focus of Krohne's work. Lang (1993) identified that women were more likely to have an association of facial expression and experience while men were more likely to associate autonomic changes with experience.

Of the studies that have differentiated somatic and cognitive anxiety, few have distinguished between state and trait differences. Barret (1972) analysed the responses of a non-clinical population to anxiety items from a large battery of commonly used scales and found two factors. While the results clearly indicated a distinction between cognitive and somatic anxiety, the scales reflected both trait and state measures. Similar factors have been identified for the Manifest Anxiety Scale (Fenz & Epstein, 1965; O'Connor et al., 1956). The Manifest Anxiety Scale is clearly a measure of personality trait. Fox and Houston (1983) distinguished two factors within the trait measure of the STAI-C with considerable unique variance.

The Cognitive Somatic Anxiety Questionnaire (CSAQ) was developed by Schwartz and colleague (Davidson, 1976; Schwartz et al., 1978) in order to distinguish between cognitive and somatic anxiety. The items were derived on the basis of commonsense and theoretical distinctions rather than statistical techniques. The CSAQ included 14 items; eight somatic and eight cognitive. The questionnaire asks participants about the symptoms they typically or generally experience. As such it would appear that this is a measure of trait rather than state emotion.

While the CSAQ was created to distinguish somatic from cognitive symptoms of anxiety, comparing results directly to somatic changes did not validate the questionnaire. A small body of literature has argued that treatments of anxiety have different efficacy depending upon whether anxiety is primarily cognitive or somatic. The CSAQ has been used to distinguish between outcomes of treatment that emphasise either somatic or cognitive anxiety. Schwartz et al. (1978) recruited 44 participants

who regularly attended physical exercise classes and 33 participants who reported practising cognitively based passive meditation at least once daily. Results indicated that those participants that exercised reported less somatic and more cognitive anxiety on the CSAQ than meditators. Such studies are of course problematic as the relationship between exercise/ meditation and cognitive/ somatic anxiety is ambiguous.

Similarly the CSAQ has been used as a dependent somatic measure in a study of the effects of comparative effectiveness of skill acquisition intervention, cue-controlled relaxation and meditation in treating test anxiety (Kirkland & Hollandsworth, 1980). It was found that the relaxation group reported a lower level of somatic anxiety on the CSAQ than the meditation group. The cognitive scale did not elicit any significant differences between groups. Both studies (Kirkland & Hollandsworth, 1980; Schwartz et al., 1978) used the CSAQ as a dependent measure. Given that the different conditions of the studies had a significant effect of the scores of the CSAQ, it is not clear that type of anxiety is an enduring characteristic of the person.

The results of Kirkland and Hollandsworth (1980) indicated that high scores on the CSAQ-S are related to emotional responses. Such emotional responses include a greater association with actual somatic changes. These results are consistent with findings in relation to the effectiveness of therapies for anxiety (Johnston, 1985; Lee et al., 1987). Cue controlled relaxation training was aimed at decreasing autonomic arousal by pairing a cue word such as calm and deep breathing with deep muscle relaxation. Such findings are consistent with the literature in which relaxation has been

found to decrease sympathetic arousal while meditation was found to decreasing intrusive thought, not autonomic arousal (Johnston, 1985; Lee et al., 1987).

Other inventories of somatic changes associated with emotion have also been examined (Shields & Simon, 1991). High scores on such inventories have been associated with a higher level of awareness of other body changes, such as rhythms and cycles (Shields & Simon, 1991). Sex differences in response to these questionnaires and differences in responses to type of emotion have also been found (Shields, 1984). Such inventories have relied upon the reports of participants of what they believe their somatic changes to be during an emotion. As such they do not necessarily distinguish groups who have a higher actual association of somatic change and the experience of emotion.

In summary, models of emotion tend to indicate that individuals differ in the relative salience of somatic changes in the experience of emotion. This is supported by the numerous research findings previously discussed. Research has also indicated that the experience of emotion, specifically anxiety, may be divided into somatic and cognitive components (see Section 1.4.3). Given the use of the CSAQ-S has indicated that some individuals tend to identify somatic factors in their experience of emotion, it seems probable that such individuals would be more likely to have a higher salience of actual somatic changes in the experience of emotion.

1.5. The Current Study

The current study compared two aspects of somatic emotion. The first aspect of somatic emotion examined was the agreement of an individual's experience of emotion with their level of bodily activity. It was expected that it was likely that individual's experience of emotion would be related to their level of bodily activity given the mechanisms of association of somatic change and experience. The agreement of an individual's experience of emotion with their level of bodily activity was called emotional-congruence.

Some studies have identified a proportion of the population who have a greater emotional-congruence, the association of somatic changes and the experience of emotion. Such sub-populations have been identified for both facial expression (Laird, 1984a; 1984b; Laird & Crosby, 1974) and autonomic activity (Egloff & Krohne, 1996; Krohne, 1978; 1986; Krohne et al., 1992). A model of individual differences of the association of somatic change and the experience of emotion is also consistent with models of emotion that include somatic components (for example, Bower, 1981; Lacey et al., 1963).

It was expected that three groups of people could be identified on the basis of emotional-congruence. One of the groups identified were those people who rated their experience of emotion lower than would have been expected from their somatic changes. Another group were those people whose rating of their experience of emotion approximated that which would have been expected from their somatic changes. The

final group identified were those people who rated their experience of emotion higher than would have been expected from their somatic changes.

The second aspect of somatic emotion examined was the range or number of somatic changes generally experienced when the individual is anxious. This was called trait-somatic-anxiety. Research has identified that some people reliably experience emotion in a way that includes somatic symptoms. Measures such as the CSAQ-S have been developed to measure the level of somatic symptoms of anxiety. It was expected that people who have a stronger association of somatic change and the experience of emotion would also experience more somatic changes associated with emotion.

Within the literature the two constructs of emotional-congruence and trait-somatic-anxiety have at times been undifferentiated. While the two constructs are related, they may be distinguished. A person may perceive a change to their somatic activity when no such change has occurred. Conversely a person's level of somatic activity may change without such change being experienced. This study examined the question, are people who have high emotional-congruence at a time of viewing a provocative stimulus more likely to report a greater number of somatic symptoms of anxiety (trait-somatic-anxiety).

1.6. Emotion Types

Two approaches to the study of emotion have been actively debated within the literature (Izard, 1990; Ortony & Turner, 1990). The first assumes there are a set of differentiated emotion including anger, disgust, fear, sadness and shame. The second measures all forms of emotion along one or more set dimensions with discriminating between emotion types. While the two approaches are compatible (Izard, 1994), many studies assume one of the two approaches to define emotion.

Studies of emotion may be divided into three broad classes. The first directs participants to a single emotion. This may either be achieved by asking participants to focus on a particular emotion, such as has been done in the study of disgust (Gross & Levenson, 1993) or by asking participants about their experience of a particular emotion (Schachter & Singer, 1962). The second examines anxiety or a broad dimension of emotion. This approach has been taken by a number of theorists including Krohne (Krohne, 1978; 1986) along with his colleagues (Egloff & Krohne, 1996; Krohne et al., 1992). The construct of anxiety and negative affect or emotionality seems to be closely related (Watson & Clarke, 1984; 1992; Watson, Clarke & Tellegen, 1984). The final type examines multiple differentiated emotions (for example Izard, 1993). In such studies a range of emotion types are examined for each participant.

Previous examinations of predictable differences in the association of the experience of emotion and somatic changes have examined emotion as a broad dimension. The research of Krohne et al. (Egloff & Krohne, 1996; Krohne et al., 1992)

examined the relationship of somatic changes with a broad dimension of anxiety. Laird (1984a; 1984b) asked participants to express a specific emotion. While the expression was clearly associated with a differentiated emotion, there was only one positive expression and one negative expression. As such the results can be interpreted in both categorical and dimensional terms (Winton, 1986).

The current study examined the experience of emotion both from the perspective of differentiated emotion, but also as a broad dimension of negative-emotion. Given the lack of consensus in relation to the two approaches, the experience of emotion was measured from both perspectives.

The design used in many examinations of emotion has been to direct participants to attend to one emotion type. This approach has a clear advantage of providing results that may be described in terms of a single emotion. This limitation of the range of emotions being measured allows for less ambiguity as to the emotion being experienced. A similar effect has been achieved by selecting a stimulus that will be likely to produce a simple single emotion (Schachter & Singer, 1962).

In the current study the stimulus material was complex. Furthermore participants were asked to respond to five categories of emotion. An aggregate score of the five emotions was also calculated and analysed. The basis for examining multiple emotions in response to a complex stimulus was in order to maximise the external validity of the procedure. Emotional responses usually involve experiences that range across the categories of emotion (Izard, 1993; Russell, 1980; Smith & Ellsworth, 1985).

Given that the aim of the study was to examine differences between the groups rather than identifying the effect of the stimulus, the procedure was designed to reflect normal emotional functioning.

1.7. The Central Research Question

The study examined the relationship of trait-somatic-anxiety and emotional-congruence. As stated in Section 1.5, this study examined the question, are people whose experience of emotion is emotionally congruent with their somatic changes at a time of viewing a provocative stimulus more likely to report a greater number of somatic symptoms of anxiety (trait-somatic-anxiety). The study compared the observed relationship of the experience of emotion and somatic changes (emotional-congruence) with participants self reports of the general tendency to experience somatic symptoms of anxiety (trait-somatic-anxiety). Given that emotion may be defined as either a general factor or specific emotion types (see Section 1.6), the relationship of emotional-congruence and trait-somatic-anxiety was examined from two perspectives. Firstly, the study examined whether people who have high emotional-congruence of somatic changes and general negative-emotion at a time of viewing a provocative stimulus were more likely to report somatic symptoms of anxiety (trait-somatic-anxiety). Secondly, the study examined whether people who have high emotional-congruence of somatic changes and individual emotion types (anger, disgust, fear, sadness and shame) at a time

of viewing a provocative stimulus were more likely to report somatic symptoms of anxiety (trait-somatic-anxiety).

Bodily changes during emotion and anxiety have previously been examined as an aspect of somatic anxiety. This study attempted to go beyond the broad distinction of cognitive and somatic anxiety. Literature in the area of the three components of emotion tends to examine multiple basic emotions and as such in this study the question of trait emotional-congruence was also examined for five emotions rather than only anxiety or general negative-emotion.

1.8. Hypotheses

As stated it was expected that three groups of people could be identified on the basis of emotional-congruence. The group identified of those people who rated their experience of emotion lower than would have been expected from their somatic changes were called the Under-Reporter Group. The group whose rating of their experience of emotion approximated that which would have been expected from their somatic changes were called the Congruent Group. The final group identified of those people who rated their experience of emotion higher than would have been expected from their somatic changes were called the Over-Reporter Group.

The association of emotional-congruence and trait-somatic-anxiety was firstly examined in terms of general negative-emotion. This was the aggregate of the emotion types (anger, disgust, fear, sadness and shame): The hypotheses was that participants in

the Congruent Group, as defined by the congruence of the experience of general negative-emotion with somatic change, would score higher on the CSAQ-S than participants in either the Under-reporter or Over-Reporter Groups.

The hypotheses for the five definitions of emotional-congruence based upon the emotion types (anger, disgust, fear, sadness and shame) were the same: that participants in the Congruent Group, as defined by the congruence of the experience of emotion with somatic change, would score higher on the CSAQ-S than participants in either the Under-reporter or Over-Reporter Groups. The five groups were defined by the emotional-congruence of somatic change with the experience of:

i) anger
ii) disgust
iii) fear
iv) sadness
v) shame

1.9. Secondary Research Question: Dependant Measure

The study used the CSAQ-S as a measure of the range or number of somatic changes generally experienced when the person is anxious. The CSAQ has been used to differentiate somatic and cognitive anxiety (Davidson, 1976; Kirkland & Hollandsworth, 1980; Schwartz et al., 1978) but has not been used in recent literature. Given this was the sole dependent measure, the Cognitive Somatic Anxiety Questionnaire was compared to other measures of anxiety: the State Trait Anxiety

Inventory (STAI), the Beck Anxiety Inventory and three forms of the Autonomic Perception Questionnaire. The CSAQ, somatic subscale (CSAQ-S) was also compared to scores on the Differential Emotions Scale. This was done to explore the validity of the CSAQ-S by the convergence of this scale with other scales.

2. Method

2.1. Participants

The sample was composed of 37 volunteer students (33 women and 4 men) from a Victorian university. Participants were recruited from lectures and participants were later contacted by telephone to arrange individual sessions. From the first point of contact any people that had any personal experience of sexual abuse were requested not to participate in the study.

Age was measured categorically. Participants selected one of seven age ranges that included their age. Twenty-seven of the participants were aged between 18 and 24. Only one participant was aged between 53 and 59. This was the oldest participant. The other nine participants were evenly spread over ages 25 to 52 (see Appendix B for table showing the representation of each age group within the sample).

Twenty-eight of the participants (78% in the sample) had never been married. Four participants were currently married, two were in a defacto relationship, two were separated and one was divorced. One participant did not indicate marital status. The high proportion of unmarried participants was consistent with 75% of the sample being under 25 years of age. Seven participants were enrolled in the Bachelor of Arts degree and two participants enrolled in teaching degrees. All other participants were study enrolled in a Bachelor of Social Science degree.

2.2. Design

A quasi-experimental design was used. The dependant measure was *trait-somatic-anxiety*. The CSAQ-S measured the construct of trait-somatic-anxiety. This questionnaire completed by participants at the first point in the procedure.

The between-subjects independent variable was *emotional-congruence* (Under-Reporter Group, Congruent Group, Over-Reporter Group). Emotional-congruence was defined by the comparison of the experience of emotion with the level of somatic activity during exposure to a provocative video stimulus. Somatic activity was measured as both facial expressivity and GSR by the researcher. The Over-Reporter Group was defined by those participants who scored a higher ranked score on their self-reported experience of emotion using the Differential Emotions Scale (see Section 2.3.4) as compared to the somatic measures. The Under-Reporter Group was defined by those participants who scored a lower ranked score on their experience of emotion as compared to somatic measures. The Congruent Group scored approximately the same on both experiential and somatic measures of emotion.

There were 12 versions of the independent variable, emotional-congruence. Participants were allocated into groups (Under-Reporter Group, Congruent Group, Over-Reporter Group) as calculated for the congruence of general negative-emotion and two forms of somatic change. General negative-emotion was the aggregate of five emotion types: anger, disgust, fear, sadness and shame. The two forms of somatic change were autonomic change (GSR) and facial expressivity. Later, participants were

allocated into groups (Under-Reporter Group, Congruent Group, Over-Reporter Group) as calculated for the congruence of each of the five emotion types and two forms of somatic change. There were therefore a total of 12 versions of the independent variable.

2.3. Materials

2.3.1. Stimulus Material

The stimulus material was a 25-minute video entitled "Secret". The video depicted the dramatisation of the sexual assault of two children by their paternal uncle. This included the times and places of the assaults as well as the distress of the children. The video did not include graphic depictions of the assaults. The video concluded with disclosures from the children and the distress of the parents.

This video was produced by Community Services, South Australia to train child protection workers and is now used across Australia. The video was selected on the basis of substantial anecdotal reports of a range of negative-emotions experienced by viewers of the video during such training. It was therefore expected that the video would elicit a range of negative-emotions in participants. Pilot testing confirmed the expected strong negative emotional response to the video. All the trial participants reported they found the video distressing. During trials participants confirmed the distressing nature of the stimulus. The researcher has been present at previous trials

during which people have needed to be removed from the screening and had been extremely upset.

2.3.2. Recording and Coding of Facial Expressions

A video camera was positioned approximately one metre above a television monitor. While participants viewed the stimulus material, a video recording was taken of participants' faces. The video camera was positioned outside of participants' normal field of vision while viewing the stimulus material but in a position to film facial expression from directly in front.

The coding of the videotaped facial expressions was based on the Maximally Discriminative Facial Movement Coding System (MAX). This system was developed by Izard (1979) to allow the reliable measurement of facial expressions. The system identifies individual facial muscles and then codes facial expression according to prototypical movements of groups of muscles. The coding procedure used in this study differed from that of the MAX in that rather than the type of change in facial expression being used to code a type emotion, a binary code of change or no change was applied. The structure of dividing the face into sections and type of changes that were examined were based on the MAX system.

The researcher viewed the videotaped data of facial expressions in 30-second intervals on two occasions. On the first occasion the researcher recorded movement in the upper face (eye-forehead) region. A score of one was assigned to participants if

there was any activity in the upper face or zero if there was no activity. Activity in the eye-forehead region was defined by one or more of the following: (a) raised eye brows (b) lowered eye brows, (c) inner part of brow raised (d) eyes squinted (e) eyes widened or (f) forehead furrowed. A total of 30 intervals were observed and therefore an aggregate score of between 0 and 30 was assigned to each participant over all segments.

The researcher then viewed the videotape on a second occasion to record whether there was any movement of the lower part of participants' faces. Such movement included (a) opening the mouth, (b) participant's tongue protruding, (c) corners of the mouth being raised or (d) corners of the mouth being lowered. Again if there was any movement during a segment, a score of one was assigned. Just as above, an aggregate score of between 0 and 30 was assigned to each participant over all segments.

2.3.3. Lafayette Polygraph

A Lafayette Polygraph was used to measure Galvanic Skin Response (GSR). The GSR measures emotional reaction by measuring changes to the electrical activity of the skin during times of emotional stress (Cacioppo et al., 1992). Electrical activity changes as a function of skin moisture. This is measured by an electrode attached to the index finger of the participants' non-preferred hand.

Gromly, Brodzinsky and Sivotn (1989) reported that GSR is unreliable with a median test-retest reliability of just $r = .34$. It should, however, be recognised that this

is only problematic if single GSR scores are being used to infer traits. Such an inference would, however, be inherently problematic given that GSR normally changes throughout a short period of measurement. When GSR scores are summed over many events (Gromly et al., 1989), split half reliability coefficients range between r = .84 and .73. Given that GSR scores are being taken throughout the procedure and compared across groups, the reliability coefficient can be justified.

The changes in skin response was recorded using the dynamic range method. For three periods of 30 seconds prior to the presentation of a segment of the Difference Emotions Scale, the minimum and maximum of the reading was recorded. The dynamic range was defined by the difference of these two scores. Given that three sets of scores were taken before each set of Differential Emotions Scale scores, the dynamic range of the GSR was recorded for each participant on 18 occasions.

2.3.4. Differential Emotions Scale

The Differential Emotions Scale was used as a measure of emotional experience during exposure to the video. The Differential Emotions Scale used in the present study closely resembled the modified version by Mosher and White (1980). The Differential Emotions Scale administered to participants consisted of six adjectives for six emotion types; a total of 36 emotion adjectives. Each emotion was rated on a scale from zero to five. A score of zero indicated an emotion was felt “not at all” while a score of five indicated that an emotion was felt “very strongly”. No descriptions were given for

other numerical ratings. The six emotion adjectives for each of the six emotion types are listed below in Table 2.

Table 2

The Six Emotion Adjectives for Each Type of the Differential Emotions Scale.

Type 1	Type 2	Type 3	Type 4	Type 5[a]	Type 6
Anger	Fearful	Disgust	Sad	Interested	Ashamed
Annoyance	Scared	Repulsion	Distress	Attentive	Humiliated
Hostile	Panicked	Nauseated	Downhearted	Excited	Mortified
Furious	Afraid	Revulsion	Miserable	Alert	Degraded
Enraged	Terrified	Sickened	Discouraged	Concentrating	Disgraced
Mad	Frightened	Distaste	Anguished	Fascinated	Dishonoured

[a] Type 5 emotion was excluded from analysis.

There have been a number of versions of the Differential Emotions Scale (Izard, 1971; 1972; 1977; 1993; Mosher & White, 1980). Izard and colleagues (Izard, 1971; 1972) developed the scale to measure 10 fundamental emotions with three adjective prompts. Mosher and White (1980) modified the Differential Emotions Scale to: (1) include sexual arousal, (2) separate shyness from shame and (3) increase the number of adjective prompts from three to six.

Two changes to the version of the Differential Emotions Scale used by Mosher and White (1980) were made for the present study. Firstly, only six of the 10 emotional types were included and sexual arousal was omitted. Mosher and White also included measures of guilt, contempt, surprise and joy. These were not included in the present

study, as the emotion types did not relate to the content matter of the stimuli. Secondly, for the present study emotions were rated on a scale from zero to five rather than from zero to three. This was done to increase the range of scores as well as to standardise the scales on which participants were to respond. The range of scores was expanded to increase the discrimination between participants.

Mosher and White (1980) do not report any of the psychometric properties of their Revised Version of the Differential Emotions Scale II. The internal consistency of other versions of the Differential Emotions Scale has been good. Anger, sadness and fear had scores of .85, .85 and .83 respectively. The scores of shame and disgust were lower, however, with scores of .60 and .56 respectively.

Unlike Izard (1972) and Mosher and White (1980), the stimulus emotional adjectives within the Differential Emotions Scale were not presented to participants within a pencil and paper questionnaire. The total of 36 adjectives in the Differential Emotions Scale were divided into three groups of 12 adjectives. Each group had two adjectives from each emotion type. Each of the 12 adjectives was displayed on the video screen. There was five seconds between the presentation of each word. The order of the adjectives was then varied and three further groups of 12 adjectives were created for the final three breaks between segments of film. Again each of these segments contained two adjectives from each emotion group. Participants responded to each of the stimulus words on a Likert type scale from zero (not at all) to five (very strongly). The scales were printed with an identifying number to the stimulus word.

The Differential Emotions Scale presented to participants included six emotion types as outlined by Izard (1972) and six adjectives associated with each emotion; a total of 36 adjectives. The six emotion types were anger, fear, interest, disgust, sadness and shame. During each segment two words from each emotion type of the Differential Emotions Scale were presented. As there were six emotion types contained in the Differential Emotions Scale used in the present study, there were 12 words presented in each segment.

For each segment two words associated with each emotion type were presented. The list was exhausted in the first three segments. The list was then again exhausted in the fourth, fifth and sixth segments. Each word was therefore presented twice. Words were presented in a fixed order, although the order was not the same during the first three segments as compared to the final three segments. A score for each of the six emotions on the Differential Emotions Scale was calculated by aggregating the score across segments for each participant.

The emotion type interest (type 5) was omitted from the analysis of data. Whereas the other five scales (anger, disgust, fear, sadness and shame) have been associated with negative-emotion, interest has not (Izard, 1993). As such interest was excluded from further analysis. The Differential Emotions Scale used in the analysis consisted of six adjectives for the five emotion types; a total of 30 emotion adjectives.

2.3.5. Cognitive Somatic Anxiety Questionnaire

Schwartz et al. (1978) developed the Cognitive Somatic Anxiety Questionnaire (CSAQ) in order to separate somatic and cognitive components of anxiety. The CSAQ has 14 items; eight somatic and six cognitive. The scale therefore elicited two scores. The first indicated the level of cognitive symptoms of anxiety. The second indicated the level of somatic symptoms of anxiety.

The CSAQ consists of 14 statements. Participants were asked to rate the degree to which the statements applied to them when they felt anxious. Participants were asked to rate the degree to which they generally or typically experienced a symptom of anxiety when anxious. Each item related to a different symptom. Items were rated between one, indicating not at all, to seven, indicating that the item was felt acutely.

Items that were evenly numbered were related to somatic or behavioural aspects of anxiety such as “my heart beats faster”. Oddly numbered items related to cognitive aspects of anxiety. These included “I imagine terrifying scenes”, “I worry too much over things that do not matter” and “I find it difficult to concentrate because of uncontrollable thoughts”. The questionnaire was scored by aggregating scores on the odd numbered and then calculating a separate aggregate for evenly numbered items. As such two aggregate scores were calculated for each participant: cognitive anxiety (CSAQ-C) and somatic anxiety (CSAQ-S). The reliability of the CSAQ has been shown to be relatively high in that the internal consistency (Cronbach's alpha) for the somatic and cognitive components has been reported to be .81 and .85 respectively.

For the CSAQ-S, there was therefore a minimum score of 8 and a maximum score of 56. A high score on the CSAQ-S indicated a large range or number of somatic changes generally experienced when the person is anxious.

2.3.6. State Trait Anxiety Inventory

The STAI has been widely used as a research tool in measuring anxiety. It includes 20 items, nine of which are reversed. Spielberger, Gorsuch & Lushene (1970) report a number of studies using the STAI with participants over the age of 18 years. In all such studies the internal consistency of the inventory was found to be good (Cronbach's $\alpha > .90$). The test-retest reliability was also found to be adequate (.86 over 20 days; .73 over 104 days).

The STAI was developed by Spielberger et al. (1970) to measure two distinct although related constructs: state and trait anxiety. State anxiety is a transient condition. Individual vulnerability to anxious emotions may be related to an underlying anxiety trait. The tendency to experience anxiety more often, more intensely and for a longer duration is incorporated into the notion of trait anxiety. This study only used the trait anxiety sub-scale.

The test-retest correlations for the trait anxiety sub-scale of the STAI has been reported as ranging from .73 to .86 with a median of .77 for tertiary students in the United States. The alpha coefficient has also been reported as high with a median coefficient across samples of .90 (Speilberger et al., 1970).

The STAI was coded in two stages. Each item was scored between one and four. These scores indicated almost never, sometimes, often and almost always respectively. The score for items 1, 3, 6, 7, 10, 13, 14, 16 and 19 were totalled. Those items indicated the absence of anxiety. The other items, which indicated the presence of anxiety, were also totalled. The first total, the aggregate of items indicating the absence of anxiety, was then subtracted from the second total, the aggregate of items indicating the presence of anxiety. A final score for the STAI was calculated by adding 45 to difference between the two total scores.

2.3.7. Beck Anxiety Inventory

The Beck Anxiety Inventory is another measure of trait anxiety. It was developed to provide a more reliable self-report instrument than cognitively based anxiety inventories to discriminate between anxiety and depression given the poor discriminative power of the most widely used measures of the two constructs (Beck, Epstein, Brown, & Steer, 1988; Tanaka-Matsumi & Kameoka, 1986). A number of researchers (Beck et al., 1988; Tanaka-Matsumi & Kameoka, 1986) have observed that the Beck Anxiety Inventory relies on somatic changes associated with anxiety to discriminate between depression and anxiety given that this is the most salient feature discriminating the two constructs. As such the Beck Anxiety Inventory may also reflect the somatic aspects of anxiety more than the cognitive aspects.

Beck et al. (1988) reported that Beck Anxiety Inventory had good internal consistency (Cronbach's α = .*92*) and reliability (test-retest correlation of .75 after one

week). Similar results have been reported by Creamer, Foran and Bell (1995) for internal consistency (Cronbach's α = .96 and .92) although reliability (test-retest correlation of .62) was lower when the time period between tests was increased to seven weeks.

The Beck Anxiety Inventory describes a list of 21 symptoms of anxiety. Participants rated the degree to which they felt the symptom in the last week. Participants rated each item either not at all, mildly, moderately or severely. A rating of not at all was scored zero, mildly was scored one, moderately was scored two and severely was scored three. An aggregate of scores on each item was calculated for each participant. No items were reversed.

2.3.8. Autonomic Perception Questionnaire

The Autonomic Perception Questionnaire was developed by Mandler (1975) in order to examine the perception of the autonomic changes associated with anxiety. The scale consisted of 18 items that referred to specific somatic changes as well as three general questions: (1) how much is one bothered by the reactions, (2) how often is one aware of bodily reactions and (3) whether one notices many bodily changes while anxious.

The Autonomic Perception Questionnaire was revised (Shields, 1984) in order to incorporate the emotions of sadness and anger in addition to anxiety. Other measures of somatic change during emotion are the Somatic Perception Questionnaire (Landley &

Stern, 1969) and the Autonomic Nervous System Response Inventory (Waters, Cohen, Bernard, Buco, & Dreger, 1984). These inventories have tended to be used to answer two related questions. The first of these questions is whether the tendency to perceive autonomic changes during emotion is associated with a tendency to perceive autonomic changes in other situation. The second question is whether the report on the perception of greater autonomic changes during emotion is related to greater accuracy in identifying changes (Katkin, 1985; McFarland, 1975; Montgomery & Jones, 1984; Whitehead, Drescher, & Blackwell, 1976). Neither of the two above questions is directly related to the actual contribution of afferent changes to the experience of emotion.

The version of the Autonomic Perception Questionnaire used in the current study included 30 somatic changes associated with emotions. This included "the intensity of my heart beat increases", "my face becomes hot" and "I get nauseated". The somatic changes described were the same for all emotions. Participants were asked to rate the degree to which they feel that somatic change from not at all to acutely on a seven-point Likert scale; one indicated not at all and seven indicated acutely. No other labels were given. Participants were asked to complete this process for sadness, anger and fear. Scores for each of the three emotion types were aggregated. There were no reversed items.

2.3.9. Demographic Data

Demographic data was elicited via questionnaire. Participants were asked what course they were undertaking, gender, age, current marital status, number of children and preferred hand. Age was measured categorically. Participants selected one of seven age ranges that included their age (see Appendix H).

2.4. Procedure

2.4.1. Induction of Participants

Participants were tested individually. On arrival they were told that the procedure would be done in two parts. They were first asked to complete a questionnaire before viewing videotape. Participants were reminded that the videotape depicted a dramatisation of child abuse and the recommendation that should they have any personal experience of this that they should not participate. Furthermore they were reminded that they could cease the testing at any time.

2.4.2. Administration Of Questionnaires

After preliminary briefing, each participant was given four questionnaires in the following order: Cognitive Somatic Anxiety Questionnaire (including CSAQ-S), Autonomic Perception Questionnaire, STAI and Beck Anxiety Inventory. No instruction was given, however, as to the order in which questionnaires were to be completed by participants. Participants completed the questionnaires alone in a small

quiet room at the university. The questionnaire took approximately twenty minutes to complete.

2.4.3. Exposure to Stimuli

On completing the questionnaires, the participants were given the next phase of the procedure. This phase involved participants viewing the 25-minute videotape and rating their emotional experiences at three-minute intervals. This took place in a testing laboratory room at the university. Participants were seated in front of the monitor. He or she was asked to place the finger electrodes on the volar pad of the index and ring fingers of his or her non-preferred writing hand. These electrodes were part of the Lafayette Polygraph[1] used to measure GSR. This procedure also took place in a testing room at the university. The experimenter then turned the GSR sensitivity to three. The electrodes were placed on the participant's non-preferred hand to minimize the effect of writing on the readings from the polygraph.

Once connected to the GSR equipment, participants were informed that during the procedure three measures would be taken: the polygraph, the videotape of their face

[1] Galvanic Skin Response, an indicator of autonomic nervous system arousal was measured with a Lafayette Polygraph. While participants were completing the questionnaire material, the experimenter prepared the Lafayette Polygraph. The sensitivity control was turned fully counter clockwise for the galvanic skin response indicator on the polygraph. The experimenter turned the polygraph on and then ensured that all pens were inked. This was done as recommended in the manual by the Lafayette Company to ensure the reliability of the instrument.

and their written experiences of emotion. They were informed that every three minutes (approximately) the video would pause and an adjective associated with emotion would be displayed on the video monitor. Participants were asked to rate their own emotional experience of that term on a scale from zero to five. They were told that a score of zero meant that did not experience that emotion at all and that five meant that they experienced the emotion strongly. Participants were asked to respond to 12 such adjectives before a further segment of film depicting the dramatisation of child sexual abuse was displayed on the video monitor. The explanation took under two minutes.

The videotape was then played. The stimulus material was proceeded by a one-minute video of a dog running in a park. This was to allow the experimenter time to ready the equipment. Throughout the stimulus material there was a total of 72 adjectives displayed. All adjectives were taken from the Differential Emotions Scale. Each word was repeated on one occasion. Table 3 shows the order of the emotion adjectives presented to participants is listed below within each segment (see Table 3).

Throughout the session, a video recording was made of participants. The recording focused on participants' faces to allow the subsequent rating of facial movements in terms of facial expressions associated with particular emotions.

Table 3

Emotion Adjectives from the Differential Emotions Scale in the Order and within Segments Presented to Participants.

Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6
Scared	Sickened	Anguished	Distress	Enraged	Excited
Anger	Disgraced	Frightened	Mortified	Concentrating	Fearful
Revulsion	Annoyance	Excited	Annoyance	Humiliated	Disgraced
Mortified	Discouraged	Fascinated	Alert	Disgust	Hostile
Interested	Concentrating	Fearful	Degraded	Downhearted	Fascinated
Afraid	Panicked	Ashamed	Anger	Scared	Furious
Degraded	Nauseated	Hostile	Interested	Sad	Ashamed
Enraged	Attentive	Distaste	Terrified	Mad	Panicked
Miserable	Furious	Mad	Repulsion	Nauseated	Revulsion
Alert	Terrified	Downhearted	Discouraged	Attentive	Miserable
Distress	Humiliated	Dishonoured	Frightened	Dishonoured	Distaste
Repulsion	Sad	Disgust	Sickened	Afraid	Anguished

Note: These adjectives were displayed one at a time on a video monitor in each segment. Each adjective was displayed for five seconds.

Normal debriefing measures were taken to ensure mood effects had dissipated. This included asking participants how they felt after the video had finished and what they thought of the video. They were also given the opportunity to discuss who they would talk to if they felt uncomfortable or continued to think about the video and ensuring that all subjects had the contact details of the experimenter, the student counsellor and relevant counselling services.

2.4.4. Calculation of Emotional-Congruence

The study examined the question of whether individuals differed in the relative strength of the association of somatic change and the experience of emotion. During the testing procedure the variables measured were GSR, facial expressivity and subjective emotional experience. Separately these variables did not directly measure the strength of the association of somatic change and the experience of emotion. As such a variable needed to be calculated that reflected the research question.

2.4.4.1. Step One

Three variables were measured during the testing procedure: GSR, facial expressivity and Differential Emotions Scale. The Differential Emotions Scale was the self report measure of emotional experience. In order to examine the level of emotional-congruence for each participant, an estimate of the subjective experience of emotion was predicted from GSR and facial expressivity using a regression model. Two separate functions were created. The first was for the subjective experience of emotion as predicted by GSR. The second was for the subjective experience of emotion as predicted from facial expression. The two estimates of the Differential Emotions Scale were termed DES_{GSR} and DES_{FACE} respectively.

The calculation of a regression function from the Differential Emotions Scale and somatic change did not make any assumption of the direction of the relationship. For example it was expected that while there would probably be a positive function of the experience of fear to GSR, the experience of sadness may be an inverse function of

GSR. There was no expectation that there would be similar functions for the relationship of the variance experiences of the emotion types to the various somatic changes.

2.4.4.2. Step Two

In order to estimate the congruence of the reported self-report of experience of emotion and the estimated self-report of experience of emotion, the difference between the reported Differential Emotions Scale and the estimate of the Differential Emotions Scale from the regression model was calculated for each participant for each emotion. This was done for each of the two estimates of the Differential Emotions Scale: the DES_{GSR} and DES_{FACE}. A score was therefore allocated to each participant for the discrepancy between predicted and reported experiences of emotion for each emotion type by both somatic changes. There were six emotion types: five specific emotion types (anger, disgust, fear, sadness and shame) and the aggregate of all the five specific types (general negative-emotion).

2.4.4.3. Step Three

For each of the discrepancy scores participants were allocated to one of three groups. These groups were the Under-Reporter Group, Congruent Group and Over-Reporter Group. Given that discrepancy scores were calculated separately for estimates of subjective emotional experience from GSR and facial expressivity, it was possible for

a participant to be in one group with respect to GSR and a different group with respect to facial expressivity.

Participants were divided into the three groups at ± 5. Scores of below -5, indicated that the report of emotion was much higher than the estimate of the experience of that emotion. These participants were allocated to the Over-Reporter Group. Scores of above 5, indicating that report of emotion was much lower than the estimate was allocated to the Under-Reporter Group. All other participants were allocated to the Congruent Group. The scores for these participants were greater than -5 and less than 5. Three groups were therefore divided: the Under-Reporter Group, the Congruent Group and the Over-Reporter Group. The rationale for partitioning the three groups at ± 5 was that across both sets of estimates and across emotion types, dividing the groups at ± 5 created three approximately equal groups.

Two categorical variables were therefore created. These were Congruence $_{GSR}$ and Congruence $_{FACE}$. For each variable there were three possible categories. The three categories were used as an indicator of the relationship of participants' reports of the experience of emotion and their level of somatic change.

2.4.4.4. Step Four

Two variables were calculated that were indicators of the actual association of the experience of emotion and somatic change: Congruence $_{GSR}$ and Congruence $_{FACE}$.

The two categorical variables, Congruence $_{GSR}$ and Congruence $_{FACE}$, were used in an analysis of variance of the CSAQ-S.

2.4.4.5. Step Five

Scores were calculated separately for each of the five specific emotions (anger, disgust, fear, sadness and shame) and for the aggregate of the five specific emotions (general negative-emotion) using the two categorical variables, Congruence $_{GSR}$ and Congruence $_{FACE}$. There was therefore a total of 12 groups calculated for the independent variable congruence.

3. Results

The independent variable was *emotional-congruence* (Under-Reporter Group, Congruent Group, Over-Reporter Group). This was a between-subjects variable and was based upon the congruence between participants' reports of their emotional experience (Differential Emotions Scale) and an independent rating of participants' somatic change. Both self reports of emotional experience and somatic change were measured during exposure to a provocative video stimulus. Participants separately rated their experience of five emotion types: anger, disgust, fear, sadness and shame. There were two forms of somatic change: GSR and facial expressivity. The measurement of GSR was used as an indicator of the levels of perspiration associated with autonomic change.

Details of the measurement of GSR are outlined in Sections 2.3.3. Facial expressivity was used as an indicator of the level of facial movement during the procedure (see Section 2.3.2 for outline). The five self ratings of emotion and the two measures of somatic change gave rise to the 10 different versions of emotional-congruence. Emotional-congruence was also examined when emotion was defined as a broad construct of *negative-emotion*. This was done by collapsing the five measures of emotion (anger, disgust, fear, sadness and shame) into one broad measure of emotion. This gave rise to two further versions of emotional-congruence: the emotional-congruence of (a) negative-emotion and GSR and (b) negative-emotion and facial expressivity. For the purpose of analysis, the same participants were separately allocated to one of the three levels of the variable emotional-congruence (Under-

Reporter Group, Congruent Group, Over-Reporter Group) for each version of emotional-congruence.

The key dependant variable was *trait-somatic-anxiety*. As outlined in Section 2.3.5, this was the range or number of somatic changes generally experienced when the person is anxious in daily life. Trait-somatic-anxiety was measured by the CSAQ-S. The CSAQ-S consists of eight statements. Participants were asked to rate the degree to which the statements generally or typically applied to them when they felt anxious. Each item related to a different somatic symptom (for example heart beats faster, perspire) possibly experienced when anxious. Item were rated between one, indicating not at all, and seven, indicating that the item was felt acutely. There was therefore a minimum score of 8 and a maximum score of 56. A high score on the CSAQ-S indicated a large range or number of somatic changes generally experienced when the person is anxious.

Separate one-way analyses of variance (see Appendix E) were applied to trait-somatic-anxiety, the dependant measure, for each of the versions of emotional-congruence, the between groups independent variable. All post-hoc tests of significant main effects of variables employed the Tukey *honesty significant difference* (HSD) procedure. The results of the post hoc tests are included in Appendix E.

Given that five emotion types were analysed from a common set of data, the required alpha level was set at a more conservative level. There were five emotion

types: anger, fear, shame, disgust and sadness. The alpha level was therefore reduced from .05 to a more conservative level of .01 for differentiated emotion types.

3.1. Emotional-Congruence Involving the Five Emotion Types and GSR

The mean score for trait-somatic-anxiety for each of the three groups (Under-Reporter Group, Congruent Group, Over-Reporter Group) for the five versions of emotional-congruence associated with GSR are contained within Table 4 and details of the separate analyses are in Table 5. Analyses revealed a significant main effect when emotional-congruence was defined by fear and GSR and a significant main effect when emotional-congruence was defined by anger and GSR. The main effect, however, was not significant when emotional-congruence was calculated from GSR and either sadness, shame or disgust.

Table 4

Mean Scores for Trait-Somatic-Anxiety by Emotional-Congruence Defined by GSR..

		Emotional-Congruence Group		
Version of emotional-congruence		Under-reporter	Congruent	Over-reporter
Anger	Mean	13.22	23.58	19.80
	SD	3.42	7.59	7.21
Disgust	Mean	18.08	22.00	19.00
	SD	8.40	7.39	7.80
Fear	Mean	11.89	24.93	20.29
	SD	3.50	5.34	7.80
Sadness	Mean	15.73	21.56	22.45
	SD	6.91	7.03	8.53
Shame	Mean	17.00	21.00	22.25
	SD	7.88	7.76	7.41

Table 5

Analysis of Variance of Trait-Somatic-Anxiety with Five Versions of Emotional-Congruence Involving GSR..

	F	*df*	MS_e	*Significance (p)*
Anger	7.19	2, 35	45.65	< .01
Disgust	1.01	2, 35	60.88	NS
Fear	12.93	2, 35	37.50	< .01
Sadness	2.74	2, 35	55.68	NS
Shame	1.54	2, 35	59.21	NS

Note: NS = not significant

Post hoc tests revealed that when emotional-congruence was defined by fear and GSR, the Under-Reporter Group had a significantly lower trait-somatic-anxiety than either the Congruent Group or the Over-Reporter Group (see Appendix E-1.1). Differences between the Congruent Group and the Over-Reporter Group were not significant. Further post hoc tests revealed that when emotional-congruence was defined by anger and GSR, the Under-Reporter Group had a significantly lower trait-somatic-anxiety than the Congruent Group (see Appendix E-2.1). Differences between the Congruent Group and the Over-Reporter Group were not significant, nor were the differences between the Under-Reporter Group and the Over-Reporter Group.

Conclusion: The Under-Reporter Groups had substantially lower (about half the score) trait-somatic-anxiety than the Congruent Group when emotional-congruence was defined by fear and GSR and anger and GSR. In the other three versions of emotional-

congruence involving GSR (disgust, sadness and shame) differences in trait-somatic-anxiety between Under-reporter and Congruent Groups were in the same direction but not significant. Only when emotional-congruence was defined by fear was the difference between the Under-Reporter Group and the Over-Reporter Group significant; with substantially lower scores for Under-Reporter Group. Although not significant, differences between the Under-Reporter Groups and Over-Reporter Group were in the same direction for the other versions of emotional-congruence. Congruent and Over-Reporter Groups did not significantly differ for any of the five versions of emotional-congruence involve GSR.

3.2. Emotional-Congruence Involving the Five Emotion Types and Facial Expressivity

The mean score for trait-somatic-anxiety for each of the three groups (Under-Reporter Group, Congruent Group, Over-Reporter Group) for the five versions of emotional-congruence associated with facial expressivity are contained within Table 6 and the five separate analyses are contained in Table 7. Analyses revealed a significant main effect when sadness and facial expressivity defined emotional-congruence. The main effect, however, was not significant when emotional-congruence was calculated from facial expressivity and either anger, fear, shame or disgust.

Conclusion: Post hoc tests revealed that when emotional-congruence was defined by sadness and facial expressivity, the Under-Reporter Group had a

significantly lower trait-somatic-anxiety than either the Congruent Group or the Over-Reporter Group (see Appendix E-5.2). Differences between the Congruent Group and the Over-Reporter Group were not significant. While the Under-Reporter Group scored substantially less in relation to trait-somatic-anxiety than other groups, there was no significant difference between the Over-Reporter Group and the Congruent Group. As with emotional-congruence involving GSR, the Under-Reporter Group tended to have lower trait-somatic-anxiety (scores less then 20) than both the Congruent and Over-Reporter Groups (scores in the low 20s). Once again most of the differences were not significant. In these results involving facial expression, only when emotional-congruence was defined by sadness was the Under-Reporter Group significantly different to other groups.

Table 6

Mean Scores for Trait-Somatic-Anxiety by Emotional-Congruence Defined by Facial Expressivity.

		Emotional-Congruence Group		
Version of emotional-congruence		Under-reporter	Congruent	Over-reporter
Anger	Mean	15.70	23.58	21.20
	SD	8.49	6.39	7.73
Disgust	Mean	16.78	22.00	21.11
	SD	8.86	6.76	8.51
Fear	Mean	16.92	22.81	21.70
	SD	9.01	6.88	6.78
Sadness	Mean	14.00	22.57	22.45
	SD	4.83	6.81	8.55
Shame	Mean	16.50	21.90	23.09
	SD	8.46	6.85	7.15

Table 7

Analysis of Variance of Trait-Somatic-Anxiety with Five Versions of Emotional-Congruence Involving Facial Expressivity.

	F	*df*	MS_e	*Significance (p)*
Anger	2.97	2, 30	55.88	NS
Disgust	1.31	2, 30	61.55	NS
Fear	1.91	2, 30	59.36	NS
Sadness	5.38	2, 32	48.19	<.01
Shame	2.48	2, 30	57.43	NS

Note: NS = not significant

3.3. Emotional-Congruence Involving Negative-emotion

In order to examine the association of somatic change and the experience of emotion where emotion was defined by a general negative factor, a factor was calculated from the five negative-emotions examined by the Differential Emotions Scale. Using a principal component analysis[2], a score was derived for each participant. This score was then used in the calculation of emotional-congruence in the same manner as was done for emotion types (anger, fear, shame, disgust and sadness).

[2] To derive overall indexes of negative emotionality, a principal-component factor analysis (with varimax rotation) of the five Differential Emotions Scale (anger, disgust, fear, sadness and shame) scores was calculated and one factor was obtained. Loadings were derived from the varimax rotation.

The mean score for trait-somatic-anxiety for each of the three groups (Under-Reporter Group, Congruent Group, Over-Reporter Group) for the two versions of emotional-congruence associated with negative-emotion are contained within Table 8. Separate analyses revealed a significant main effect when emotional-congruence was calculated in relation to negative-emotion and GSR, F (2,33) = 5.15, MS_e = 48.42, p < .05, as well as a significant main when emotional-congruence was calculated in relation to negative-emotion and facial expressivity , F (2,33) = 6.00, MS_e = 46.12, p < .05.

Post hoc tests of both significant main effects revealed that the Under-Reporter Group had a lower mean score for trait-somatic-anxiety than either the congruent or Over-Reporter Groups. This indicated the Under-Reporter Group had a significantly fewer number of somatic changes generally experienced when anxious than either the Congruent Group or the Over-Reporter Group (see Appendix F). There was no significant difference between the Congruent Group and the Over-Reporter Group.

Table 8

Mean Scores for Trait-Somatic-Anxiety by Emotional-Congruence Defined by Negative-Emotion.

		Emotional-Congruence Group		
Version of emotional-congruence		Under-reporter	Congruent	Over-reporter
GSR	Mean	14.40	22.93	22.36
	SD	6.79	5.15	9.01
Facial Expressivity	Mean	13.50	23.43	22.67
	SD	5.76	6.73	7.66

3.4. Examination of Dependant Measure

As previously outlined (Section 1.9: A Secondary Question: The Dependant Measure), the CSAQ-S has not been a measure that has been widely used in emotion research. Given this, three other measures were also administered to provide a comparison with CSAQ. These were the STAI-Y, the Beck Anxiety Inventory and three forms of the Autonomic Perception Questionnaire. Details of each of these questionnaires are outlined in Section 2.3. These three forms reflected perception of somatic changes associated with fear, anger and sadness. It was found that such measures were significantly correlated with the CSAQ-S. Correlations of the CSAQ-S with the STAI were $r = .53$ ($p < .001$) and with the Beck Anxiety Inventory were $r = .64$

($p < .001$). Similarly correlations of the CSAQ-S with the Autonomic Perception Questionnaire: for fear were $r = .59$ ($p < .001$), for anger were $r = .68$ ($p < .001$) and for sadness were $r = .55$ ($p < .001$) (see Table 9).

Table 9

Correlation between CSAQ-S and other inventories of anxiety.

STAI: Trait	.53[c]
Beck Anxiety Inventory	.64[c]
CSAQ-C	.80[c]
APQ[d]: Fear	.59[c]
APQ[d]: Anger	.68[c]
APQ[d]: Sadness	.55[c]

[a] p>.05,

[b] p>.01,

[c] p>.001

[d] Version of the Autonomic Perception Questionnaire

The CSAQ-S was also compared with the Differential Emotions Scale. This was done by dividing the sample into two groups at the median of scores on the CSAQ-S. It was found that two groups did not significantly differ on mean scores on the Differential Emotions Scale for anger, fear, disgust or shame. The results are reported in Appendix G-2. The two groups did however significantly differ on mean scores on the

Differential Emotions Scale for sadness, F (1, 36) = 7.90, MS_e = 36.88, $p < .05$). Participants who scored lower than the median on the CSAQ-S reported a mean rating of sadness during the procedure of 40.80 (SD = 9.60) as compared to 48.00 (SD = 6.50) for those participants who scored lower than the median (see Section 2.3.4 for outline of use of Differential Emotions Scale).

3.5. Post Hoc Examination of Groups

The method of determining the 12 versions of emotional-congruence has been previously discussed in method (see Section 2.4.4) and results (see Section 3.0). The method involved calculating an estimate of emotional experience from somatic changes. Assignment to one of these groups was then based upon whether the estimate approximated or did not approximate reported emotional experience.

The study did not assume that the experience of emotion could be predicted directly from somatic changes. Rather the study examined whether the predictions of the experience of emotion were better for an identifiable Section of the population. The fact that estimates of emotion were calculated from somatic changes does not indicate an assumption that somatic changes were a reliable predictor of emotion.

Nor did the study assume that estimates be consistent across somatic changes for the same participant. Estimates of emotion and subsequent identification of groups were conducted separately for GSR and facial expression. Each participant was assigned to a group twice. It was found that participants tended to be assigned to the

same group irrespective of which emotion type or somatic change was used to estimate the emotion. The percentage of participants assigned to the same group is listed below for each emotion (see Table 9). The greatest difference was for disgust and fear. Even for these groups more than three quarters of participants were assigned to the same group.

Table 9

Percentage of Participants in Same Group as Calculated from GSR and Facial Expressivity.

Emotion Type	Percentage of participants
Anger	84.8%
Fear	75.8%
Disgust	75.8%
Sadness	94.3%
Shame	93.9%

4. Discussion

The major finding of the study was that when emotional experience was measured as general negative-emotion, and to some degree when emotion was measured as discrete emotion types, participants who reported less emotional experience as compared to their somatic change during testing sessions also reported less somatic changes generally when anxious. Emotional experience was compared to somatic changes during testing sessions while participants were viewing a distressing provocative video. Somatic changes generally when anxious was measured by the CSAQ-S before the video. A significant proportion of the variance of the CSAQ-S was explained when the congruence of the experience of emotion and autonomic change as well as the congruence of the experience of emotion and facial expressivity was considered.

This study was unique in that two measures of somatic change were used and that emotion was defined both as emotion types and general negative emotion. The study found that dependant upon the measures of somatic change and whether emotion was defined both as emotion types or general negative emotion impacted on the results. Specifically, the study found that participants who reported an experience of emotion lower than would have been expected from their somatic change (the Under-Reporter Group), scored lower on the CSAQ-S than other participants (the Congruent and Over-Reporter Groups) for the following conditions:

1. experience of emotion was defined as general negative-emotion (the aggregate of emotion types) and somatic change is defined by facial expressivity,

2. experience of emotion was defined as general negative-emotion (the aggregate of emotion types) and somatic change is defined by GSR,
3. experience of emotion was defined as fear and somatic change is defined by GSR, and
4. experience of emotion was defined as sadness and somatic change is defined by facial expressivity.

Furthermore, participants who reported an experience of anger lower than would have been expected from their GSR, scored lower on the CSAQ-S than other participants whose experience of anger matched their autonomic arousal (the Congruent Group). There were, however, no significant differences between the Over-Reporter Group and the Under-Reporter Group.

The CSAQ-S was half of an inventory of trait anxiety, the Cognitive Somatic Anxiety Questionnaire. The Cognitive Somatic Anxiety Questionnaire also has a scale of cognitive anxiety. The results of this study indicate that rather than high scores on the somatic items on the CSAQ-S indicating anxiety per se, high scores on the somatic items seem also to indicate a greater congruence (or over-reporting) of somatic changes when that person is experiencing emotion. As such the results indicated that the score on the CSAQ-S indicated the likely association of the experience of emotion and somatic change. Given that the CSAQ-S was a measure of a trait of emotional functioning, this would tend to indicate that emotional-congruence might be a stable personality trait.

The remainder of the discussion contains six main sections. The first examines the finding that when emotional experience was measured as a broad factor of negative-emotion there was a difference between the groups in terms of trait-somatic-anxiety as indicted by scores on CSAQ-S. The second examines the differences in the findings across the emotion types: anger, disgust, fear, sadness and shame. The third and fourth section examines the findings in the context of broad theories of emotion and compares the method of this study with previous studies. The fifth section examines the limitations of the study. The final section includes a discussion of the implications for the use of the CSAQ-S, practise and future research.

4.1. The Examination of Negative-Emotion

The study found that the emotional-congruence of general negative emotion was associated with different scores on the CSAQ-S across very different measures of somatic change. Two versions of emotional-congruence were examined in this study in relation to negative-emotion. This study identified a group of participants whose experience of negative-emotion was related to facial expressivity. The study also identified a group of participants whose experience of negative-emotion was related to autonomic change. For both versions of emotional-congruence, the Under-Reporter Group scored lower on the CSAQ-S. This supported the hypotheses outlined in section 1.8.

Two reasons may be identified that explain this result. The first is that such people may have a tendency to rate scales lower, irrespective of their emotional content. This would have impacted on their ratings of emotion through the Differential Emotions Scale and their ratings of the CSAQ-S. It should be noted that a high score on all items of the CSAQ-S indicate high somatic anxiety. It would not have impacted on measurements of autonomic change or facial expressivity, which were measured externally rather than through self-ratings.

There is a second possible explanation for the result that such people were under-reporters of negative-emotion and had lower trait-somatic-anxiety as indicated by reports of fewer somatic symptoms of anxiety generally experienced. Such people may chronically not experience somatic changes during negative-emotion even though such changes occur. This possibility will be explored later in further detail.

Two other groups were identified in the study in relation to the association of the experience of negative-emotion and somatic change. The second group of participants' experience of emotion approximated their somatic changes. This was the Congruent Group. The third group of participants were those who tended to report a higher level of negative-emotional experience than would have been expected from observations of their somatic change. This did not indicate that such people rated negative-emotion greater than was experienced. The ability to experience emotion in the absence of somatic change is well documented (Harris & Katkin, 1975; Izard, 1993; Lang, 1994; Lazarus, 1984; 1991).

The first group, the Under-Reporter Group, scored lower on the CSAQ-S than either of the other two groups. The results of the study support the idea that individuals vary in emotional-congruence as a function of a trait of personality. The CSAQ-S is a trait measure. It was found that scores on the CSAQ-S were differentiated by the observed emotional-congruence of participants. This was the case for both versions of emotional-congruence (groups defined by the experience of negative-emotion with GSR as well as facial expressivity). This would suggest that the two versions of congruence with negative-emotion reflected differences in a trait: the range or number of somatic changes generally experienced when the person is anxious.

As previously discussed, few other studies have examined emotional-congruence associated with negative-emotion as a function of a trait of personality. An example of where such an association has been found is where the relationship of negative-emotional experiences and autonomic change has been found to mediated by cognitive styles of coping (Krohne, 1978; 1986; Krohne et al., 1992). Such styles of coping as have been found to be reliable across time for an individual (Krohne, 1978; 1986). It is therefore reasoned that the relationship of negative-emotional experiences and autonomic change mediated by cognitive styles of coping would also be reliable.

Similarly the relationship of emotional experiences and facial expressivity has been found to mediated by cognitive structures of memory. Laird (1984a) examined the recollection of information with an emotional theme. He found that some people recalled such information better when their facial expression matched the emotional theme. He further found such people reported a greater relationship of emotional

experiences and facial expressivity in their daily lives. There was therefore a link between actual facial expressivity and information recall and general experiences of emotion. This finding suggests that the relationship of emotional memories and facial expression in specific instances may also be associated with the range or number of facially expressive changes generally experienced when the person is emotional.

The independent variable in this study was emotional-congruence; the actual association of somatic change and the experience of negative-emotion. This was similar to the study by Krohne et al. (1992). The results indicated that actual association of somatic change and the experience of negative-emotion is associated with the range or number of somatic changes generally experienced when the person is anxious. It does not comment on the presence of absence of the role of coping mechanisms. Laird's study (1984a) suggests the relationship of emotional memories and facial expression in specific instances may also be associated with the range or number of facially expressive changes generally experienced when the person is emotional. The results of this study indicated that actual association of facial change and the experience of negative-emotion is associated with the range or number of somatic changes generally experienced when the person is anxious. These findings of this study are therefore consistent with such other studies (Krohne et al., 1992; Laird, 1984a).

This study found that groups defined by the actual association of somatic change and the experience of negative-emotion, emotional-congruence, differed in their report of the range or number of somatic changes generally experienced when the person is anxious. Those who reported negative-emotion lower than would have been expected

from their somatic change, also scored lower compared to other participants on the CSAQ, subscale. This supports the idea of an association of reports of few somatic symptoms of anxiety generally and an actual lower level of association of experience and somatic change.

4.2. The Examination Of Differentiated Emotion Types

Following examining emotional-congruence as a general negative-emotion, the relationship between trait-somatic-anxiety and emotional-congruence was examined for specific emotion types: anger, disgust, fear, sadness and shame. Each of these will be discussed.

4.2.1. Fear

This study found that those participants whose experience of fear was emotionally-congruent with their GSR had a higher mean score on the CSAQ-S, a measure of trait-somatic-anxiety than the Under-Reporter Group. Members of the Under-Reporter Group had the lowest mean score on the CSAQ-S. This indicated that those participants who had a lower correspondence of somatic symptoms with the experience of fear, reported less symptoms generally associated with anxiety.

The salience of autonomic change in differentiating the Congruent Group for fear reflected a similar salience of autonomic change for the factor of negative-emotion. This is consistent with the literature in relation to negative-emotion. Watson and Clarke (1984; 1992) suggested that fear was highly related to experiences of negative-emotion, more so than other negative emotions such as anger, sadness and disgust. While all emotion types (anger, disgust, fear, sadness and shame) may have been used to calculate general negative-emotion, it would appear that fear most closely approximates "average" general negative-emotion.

The results supported the hypothesis for emotional-congruence in relation to GSR and fear. When emotional-congruence was calculated from fear and GSR, participants who reported their experience of emotion to be lower during the testing procedure than would have been expected from their level of somatic change also tended to score low on the CSAQ-S. When the mean score on the CSAQ-S was for the Under-Reporter Group was calculated, the score was comparatively low. This was the

lowest score for any group irrespective whether congruence was calculated from autonomic change or facial expressivity across emotion types. Furthermore in relation to fear, the Congruent Group as calculated from fear and GSR, had the highest mean score on the CSAQ-S irrespective of emotion type or whether congruence was calculated from autonomic change or facial expressivity.

The Under-Reporters Group was characterised by participants who reported a lower level of emotional experience than would have been expected from their level of somatic change. As such it may be asserted that the difference between the mean scores for the Under-Reporters Group and the Congruent Group may be explained by a general tendency to mark any scale towards the lower end irrespective of content. All items were rated in the same direction. If a participant were to tend to rate any scale at the lower end, they would score lower on both the Differential Emotions Scale and the CSAQ-S. This would not, however, affect scores on the GSR or facial expressivity, both of which are scored by the experimenter. A reduction in the score on the Differential Emotions Scale but not the GSR score or the score for facial expressivity would increase the chance of a participant being assigned to the Under-Reporter Group.

The effect of participant differences in tendency to mark the scales higher or lower irrespective of content would not explain the results when considered in the context of the three groups of participants. Such a general tendency would not explain the difference in the mean score on the CSAQ-S across the three groups. There was a lower mean score on the CSAQ-S for the over-reporters group as compared to the Congruent Group. The over-reporters group was characterised by a higher rating on the

Differential Emotions Scale than would be expected from somatic changes. As such member of this group scored the Differential Emotions Scale higher than would have been expected but the CSAQ-S lower than Congruent Group. While differences between the Congruent and Over-Reporter Groups were not significant, results are not consistent with an explanation of results based upon a general tendency to rate scales higher or lower.

The emotional-congruence of facial expression and the report of fear did not explain the variance of the CSAQ-S. This indicated that the relationship of facial expressivity and the report of fear did not predict trait-somatic-anxiety. This will be discussed further in section 4.2.3..

4.2.2 Anger

When emotional-congruence was defined by anger and GSR, there was a significant difference in scores on the CSAQ-S for the Congruent and Under-Reporter Groups. Participants who reported an experience of anger lower than would have been expected from their GSR (Under-Reporter Group), scored lower on the CSAQ-S than other participants whose experience of anger matched their autonomic arousal (the Congruent Group). There was no significant difference between the Under-Reporter and Over-Reporter Groups.

As was the case for the version of emotional-congruence defined by fear and GSR, the finding that anger and GSR is associated with trait-somatic-anxiety is

consistent with research indicating a strong link between anger and somatic change (Levenson et al., 1991; Levenson et al., 1990; Schachter & Singer, 1962). Furthermore there are also similarities with fear in the association of anger and negative emotionality (Watson and Clarke, 1984; 1992). It may therefore be expected that this version of emotional-congruence was found to associated with scores on the CSAQ-S.

The emotional-congruence of facial expression and the report of anger did not explain the variance of the CSAQ-S. This indicated that the relationship of facial expressivity and the report of anger did not predict trait-somatic-anxiety. This will be discussed further in section 4.2.3.

4.2.3. Sadness And Other Versions Of Emotional-Congruence Involving Facial Expressivity

There was no significant difference between the groups when emotional-congruence was defined by sadness and GSR. There was, however, a significant difference between the Under-Reporter Group and other participants when emotional-congruence was defined by sadness and facial expressivity. Those participants who tended to report a lower level of sadness than was indicated by their level of facial expressivity, tended to score lowly on the CSAQ-S.

This result may indicate an association of sadness and facial expression at one point in time with scores on the CSAQ-S. Such an explanation would seem unlikely in

the context of a lack of similar associations of any of the other emotion types and facial expressivity and the content of the CSAQ-S reflecting autonomic and behavioural changes rather than changes to facial expression. An alternative explanation may be given for the finding that participants who tended to report a lower level of sadness than was indicated by their level of facial expressivity, also tended to score lowly on the CSAQ-S. It may have been that those who scored lowly on the CSAQ-S tended to report a low level of sadness irrespective of facial expressivity. This is supported by the fact that there was a significant difference between high scorers and low scorers on the CSAQ-S in relation to sadness, but not any other emotion types as recorded by the Differential Emotions Scale.

There was no significant difference of scores on the CSAQ-S between groups defined by the emotional-congruence of facial expression and any of the other emotion types: anger, disgust, fear and shame. As alluded to above, one explanation for this is related to the content of the CSAQ-S. The CSAQ-S did not include any items that related to facial expressivity. Some items related to behaviours such as “I pace about nervously” or “I get immobilised” while others related autonomic changes such as “I perspire” or “my heart beats fast”. No item related to facial expressivity. It may have been expected that given no item related to facial expressivity, there was less likely to be a relationship between trait-somatic-anxiety and versions of emotional-congruence related to facial expressivity than versions of emotional-congruence related to GSR.

4.2.4. Shame And Disgust

The results indicated that when groups were discriminated by the congruence of the experience of either shame or disgust with somatic changes, such groups did not differ in relation to participants' trait-somatic-anxiety as indicated by their mean score on the CSAQ-S. Neither the congruence of shame or disgust with somatic change predicted scores on CSAQ-S. This was consistent for both GSR and facial expressivity. It would be unlikely that this finding of was a function of participants not experiencing shame and disgust. Raw scores on the Differential Emotions Scale indicated that participants experienced both emotion types. The mean score for the sample on the Differential Emotions Scale was higher for disgust than for fear.

The central hypothesis of the current study was that scores on the somatic scale on the CSAQ-S would predict the association of somatic change with the experience of emotion. There are three possible explanations for there not being a significant association between somatic changes and the experience of disgust and shame. The first possibility is that disgust and shame may not associated with any pattern of somatic change. This would seem to be unlikely given those distinct patterns of somatic changes in relation to facial expression (Ekman et al., 1983; Izard, 1977; Izard, 1993) and autonomic change (Ekman et al., 1983; Gross & Levenson, 1993) have been demonstrated.

Another possible explanation is that the association of somatic changes with the experience of disgust and shame may not be subject to individual variation in the

strength of that association. While much of the research in the area of facial feedback has either examined broad dimensions of pleasantness rather than specific emotions such as disgust and shame (Winton, 1986), there has been some studies that have examined disgust and found significant differences between individuals. Lang (1993) examined the relationship between experiences of displeasure and facial expressions when participants were exposed to slides of grisly mutilations and found significant individual differences. While disgust was not examined per se, it seems probable that a slide of a mutilation would elicit disgust. This would tend to indicate that disgust was associated with individual differences in the association of experience and somatic change. There is no specific evidence to date that individuals vary in the association of shame and somatic change.

The alternative explanation may be that the CSAQ-S may not be a good indicator of the association of somatic change and shame or disgust. The somatic changes associated with disgust, especially cardiovascular responses are significantly different to those changes associated with anger, fear or sadness (Ekman et al., 1983; Gross & Levenson, 1993). There is data in relation to the somatic correlates of shame. While shame and disgust may be associated with other negative-emotions as a function of being unpleasant, the somatic changes associated with disgust and shame may be different.

The result that the CSAQ-S did not predict the association of somatic changes and the experience of disgust may be understood in the context of James' theory of instincts (James, 1890). Lang (1994) examined James theory that instincts are built into

organisms and organise emotional reactions. He compared the theory of emotion asserted by James to associative learning in rats. In particular he demonstrated that the startle reflex is associated or potentated by negative-emotion. He concluded that modern neuroscience has supported James' association of innate instinct and physiological structures of emotion. In doing so Lang compared the association of emotions and instincts to the Seligman's construct of preparedness and Lorenz's construct of imprinting (Lang, 1994). Implicitly Lang argued that there are hard-wired associations within and among emotions.

Given that the CSAQ-S was a measure of types of anxiety, it may be reasonably questioned whether there are hard-wired associations between anxiety and disgust. Again drawing from comparative psychology, Garcia, Lasiter, Bermudez-Rattoni and Deems (1985) found that anxiety and disgust were hard-wired to different stimuli and different physiological responses. This was shown using a classic behavioural procedure. Rats were placed in a box with a light and food. The light was turned on while the rats were eating. Rats were then exposed to either an electric shock, which caused pain, or a microwave, which caused illness. It was found that the visual stimulus (the light) was more readily associated with pain while gastronomic stimulus (the food) was more readily associated with illness.

The results of Garcia et al. may be compared to emotional responses of disgust and anxiety. While the observations of Garcia et al. cannot be equated to emotions, within the framework proposed by Lang (1994) and James (1884; 1890) Garcia's observations may be interpreted as indicative of the independence of two instincts.

Given the association of fear and anxiety to pain and danger (Garcia et al., 1985) and disgust to illness (Garcia et al., 1985), it may be expected that the two emotions would have some degree of independence.

Whether or not some individuals do have a greater association of disgust with somatic change cannot be determined by the current study. The results of this study indicated that the versions of emotional-congruence defined by disgust does not predict scores on the CSAQ-S. This, however, does not exclude the possibility that emotional-congruence defined by disgust may be differentiated by a trait measure more specific to disgust.

4.2.4. Summary and Conclusion

There was a similar relationship of the Congruent Group and Under-Reporter Groups in relation to trait-somatic-anxiety when emotional-congruence was defined by GSR and fear as compared to when defined by GSR and anger. The study found that those participants whose experience of fear generally matched their autonomic arousal (the Congruent Group), scored higher on the CSAQ-S than those who reported an experience of fear lower than would have been expected from their autonomic arousal (the Under-Reporter Group). Those participants whose autonomic arousal matched their experience of anger (the Congruent Group), scored higher on the CSAQ-S than those who reported an experience of anger lower than would have been expected from their autonomic arousal (the Under-Reporter Group).

The relationship of the Over-Reporter and Under-Reporter Groups in relation to trait-somatic-anxiety was very different when emotional-congruence was defined by GSR and fear as compared to when defined by GSR and anger. There was no difference in relation to trait-somatic-anxiety between Under and Over-reporters of anger. The study found, however, that those participants whose experience of fear generally was greater than their autonomic arousal (the Over-Reporter Group), scored higher on the CSAQ-S than those who reported an experience of fear lower than would have been expected from their autonomic arousal (the Under-Reporter Group).

The results of this study further indicated that when emotional-congruence was defined by GSR and any of the remaining emotion types (sadness, disgust and shame), emotional-congruence did not predict trait-somatic-anxiety. The only version of emotional-congruence related to facial expressivity that predicted trait-somatic-anxiety was emotional-congruence calculated from facial expressivity and sadness. Given the association of scores on the CSAQ-S and the Differential Emotions Scale of sadness, the meaning of such a finding is ambiguous.

Some caution should be exercised in the discrimination of findings between emotion types. The smallest proportion of common variance among the five negative-emotions is between shame and disgust with 71.7% of variance being common. The greatest proportion of common variance is between disgust and anger at 91.0%. This is probably the reflection of significant interaction between the emotions and a reflection of complex underlying structures and processes. The relationship of fundamental emotions is a complex question beyond the scope of the present study. The question

applied in this study was not what processes lead to each emotion, but rather, can the construct of trait emotional-congruence as measured by the CSAQ-S be applied to a range of emotions.

The aim of the study was not to examine the validity of differentiating basic emotion types. It was recognised that some critics of Differential Emotions Theory argue that emotions reflect stable dimensions of appraisal that are universally applied rather than the interaction of basic emotions (Ortony & Turner, 1990; Turner & Ortony, 1992). Furthermore individual somatic changes may be associated individual dimensions of cognitive processes (for example, Ortony & Turner, 1990; Scherer, 1992; Smith & Ellsworth, 1985; Turner & Ortony, 1992). Such models may predict that a stimulus that is appraised to be novel would elicit raised brows, if the stimulus was non-Congruent with personal goals, then a tensed voice may result (Scherer, 1982).

Both models of emotion types such as Differential Emotions Theory and dimensional theories such as that described by Scherer (1982; 1992) assume a component model of emotion. Theorists advocating a dimensional component process model (Scherer, 1992) have applied such dimensions to the explanation of the experience (Ortony & Turner, 1990; Smith & Ellsworth, 1985) and autonomic changes (Scherer, 1992) associated with emotion as well as changes to facial expression. In some cases different levels of appraisal will compete in areas of somatic change. This model is, however, a significant departure from a notion of central basic emotions. The study assumed a component model of emotion but examined emotion both as a general factor and as a set of emotion types.

The results of the study do not support the assertion that emotions reflect basic types in the context of broad models of emotion. The results do, however, indicate that observations of the emotional-congruence of somatic change and the experience of emotion for one emotion type does not necessarily indicate the general level of somatic activity associated with the experience of emotion for that individual across emotion types. Specifically, while observations of the congruence of fear with somatic change predicts participants' reports of the level of somatic symptoms they associate with anxiety, the observation of the congruence of shame or disgust with somatic change does not. Emotion type therefore appears to be an important variable in the association of experience and somatic change for an individual.

4.3. Theories of Emotion

A number of models of emotion have been discussed that while they do not directly model emotional-congruence, they include both the experiences of emotion and somatic changes. In order to contextualise the results of the study, the results will be discussed in the context of two models of emotion: (1) Lacey's model of Response Stereotypy and (2) Bower's Semantic Network Model of Emotion.

4.3.1. Individual Response Stereotypy

The results of this study may be compared to the results of Pennebaker (1982) and Pennebaker and Brttingham (1982). In this study we found that a group could be

identified that was less likely to either report or experience general negative-emotion than would have been expected from somatic changes. This group was the Under-Reporter Group. Such people tended to have lower scores on the CSAQ-S. This would suggest that for some individuals, somatic changes were less salient for their experience. Just as Pennebaker (1982) and Pennebaker and Brttingham (1982) found that somatic changes may be comparatively more or less salient in the experience of fatigue dependent upon the individual and the environment (see Section 1.4.4), this study would suggest that somatic changes may be comparatively more or less salient in the experience of general negative-emotion. While this study however found focused on trait rather than environmental sources of variation, and emotion rather than fatigue, the principle of competing cues is similar.

The model of Individual Response Stereotypy (Lacey, 1959; 1967; Lacey et al., 1963; Lacey & Lacey, 1958; 1962) would suggest that types of somatic change also "compete" for salience and individuals tend to express an emotion through one in preference to another. It may therefore be expected that there would be a substantial differentiation in the association of emotion with facial expressivity and the association of emotion with GSR. Results in fact indicated that more than three quarters of participants were in the same group across versions of emotional-congruence defined by GSR and facial expressivity for each emotion. When emotional-congruence was defined for sadness 94.3% of participants in the one group defined by facial expressivity, were in the same group when defined by GSR.

Individual Response Stereotypy may however be used to explain, in part, some of the findings in relation to emotion types. The study did however find that the Under-Reporter Group scored lower on the CSAQ-S than other participants when their experience of emotion was defined as fear and somatic change was defined by GSR. Also the Under-Reporter Group for anger and GSR, scored lower on the CSAQ-S than the Congruent Group. Unlike other versions (for example fear and GSR), there was however no significant difference between the Over-Reporter Group and the Under-Reporter Group.

As has been discussed, the emotion of fear is closely related to anxiety and general negative-emotion (Watson and Clarke, 1984; 1992). Anger has also been closely, though less so than fear, with anxiety and general negative-emotion (Watson and Clarke, 1984; 1992). The dependant measure in this study, the CSAQ-S, was an anxiety inventory that focused on autonomic rather than facial symptoms of anxiety. The results therefore are consistent with previous studies indicating that while Individual Response Stereotypy may be applied to facial expressions and gross motor behaviour as well as autonomic activity (Cacioppo et al., 1992), individual response stereotypy may be influenced by the commonality of two situations (Fahrenberg, et al., 1986; Foerster, 1985) and is more predictive when the situation is constant (Foerster, 1985; Myrtek, 1984). There has also been found to be significant variation between facial expression and GSR (Lang, 1993) with greatest co-variance occurring between similar somatic components. The results of this study that emotional-congruence defined by fear and GSR, and anger and GSR to a less extent, were the most predictive

of trait-somatic-anxiety was consistent. Such versions of emotional-congruence are most consistent with the content of the CSAQ-S.

4.3.2. The Bower's Semantic Network Model Of Emotion

The results of the study indicated that emotional-congruence was not only dependant upon individual differences (as predicted by trait-somatic-anxiety), but also the difference between emotion types. This is consistent with the Semantic Network Model of Emotion. The Semantic Network Model of Emotion explicitly includes individual differences and differentiated emotion types within the model. The model is based on associative networks of components of emotion. A number of theorists have suggested that a model of associative networks may be used to explain the relationship of emotion and somatic changes (for example, Bower & Cohen, 1982; Harris & Katkin, 1975; Izard, 1993; Lang, 1979). As previously described (see Section 1.4.1) an associative model of emotion would expand the classical model of stimulus-response association to include the range of responses associated with emotion; including experiential, expressive and autonomic responses.

The model proposed by Bower and colleagues (Bower, 1981; Bower & Cohen, 1982; Gilligan & Bower, 1984) has previously been discussed in the context of the association of somatic change and a general factor of negative-emotion. It has already been discussed that the model proposed by Bower is consistent with previous findings that autonomic arousal (Egloff & Krohne, 1996; Krohne, 1978; 1986; Krohne et al., 1992) and facial expressivity (Laird, 1984a; 1984b) may have a greater association with

the experience of general emotionality for some individuals. It was further identified that such individuals may be identified by their self-report of their general functioning.

Two findings of the current study may be further applied to The Semantic Network Model of Emotion. The first was that the association of the experience of emotion types and somatic change is not generalised across emotion types. The model proposed by Bower explicitly incorporates emotion types (Babbit, 1982; Bower & Cohen, 1982; Izard, 1990). The second finding is that the emotional-congruence of experience of some emotion types and somatic change is predictive of traits of the individual (trait-somatic-anxiety). Such is consistent with Bower's model of the architecture of the cognitive structure of an individual.

The results of this study indicated that participants, who have a emotional-congruence of somatic change and the experience of fear, tended to score higher on the CSAQ-S. Group differences were also found in relation to anger. Group differences were not, however, found for other emotion types or the association of fear or anger with facial expressivity. Such a finding suggests that the congruence of emotional experience and somatic change is a joint function of the individual and the emotion type.

The Semantic Network Model of Emotion is consistent with such a finding. First, this model of emotion is consistent with somatic change being associated with one emotion type without being associated with a second emotion type. In this model the emotion type is the nucleus of the emotion network. A component such as breathing

rate or lowering of the brow may be associated with one emotion type without affecting another.

Second, the Semantic Network Model of Emotions may be used to explain why the experience of emotion is associated with somatic change for some individuals, but not others. Given that the associative networks as outlined in The Semantic Network Model of Emotion are largely dependent upon the learning of the individual, this model is consistent with individual differences between participants. Bower (1981) and colleagues (Bower & Cohen, 1982; Gilligan & Bower, 1984) clearly state that some of the associations (stems) between components (nodes) may be innate. Many of the associations are learnt. Given that the results indicated that individual differ in the salience of such associations, the observations of this study are well explained by this model.

A model of associations between somatic changes and the experience of emotion is supported by the observations of Lewis and Michalson (1983). It was observed that children tended to learn labels for emotions by parents labelling the children's expressions of emotion. Lewis and Michalson asserted that such learning contributed to the children's development of the experience of emotion. If the development of such associations were dependent on environmental conditions, that is parental feedback, individual variation would be expected.

A Semantic Network Model may be used to illustrate the results. It would be assumed that an individual would have nodes representing each of the emotion types as

well as the ranges of somatic and behavioural changes associated with emotion. An individual may through their experience have developed a complex web of associations between such nodes. This may include a number of associations between an emotion type and autonomic and behavioural changes such as GSR. In this case it would be expected that a substanciatial web of associations would lead to a high score on the CSAQ-S. Similarly such a web of associations may lead to greater regulatory loops between experiential and somatic nodes and therefore high emotional-congruence. Conversely a more scant set of associations between nodes would lead to both a lower score on the CSAQ-S and a high probability of emotional incongruence.

From the perspective of the Semantic Network Model, the results that the versions of emotional-congruence associated with fear and anger with GSR being significant may be explained. It has been discussed that the content of the CSAQ-S referred to behaviour often associated with both emotion types: pacing, increasing heart beat, perspiring. Such somatic changes are more likely to be conscious if associated with a complex network (Egloff & Krohne, 1996). It may therefore be expected that participants who are conscious of such changes are more likely have an associated web of associations and therefore more likely to be associated with emotions such as anger and fear.

As discussed by Izard (1990; 1993), theories of learnt associations and innate emotional systems are complementary rather than contradictory. It is expected that when distressed, an individual may become automatically aroused (Lewis & Michalson, 1983) and that such an association does not have to be learnt. The possibility of innate

associations is not denied (Bower, 1981; Bower & Cohen, 1982; Gilligan & Bower, 1984) by Network Theory, however, nor are they assumed to explain all associations.

4.4. Comparison of Methodology with Previous Studies

While the current study is unique in the examination of the relationship of emotional-congruence and trait-somatic-anxiety and indeed the use of the term emotional-congruence, similar constructs have been used in a limited number of previous studies. As previously discussed (see Section 1.4) Krohne et al. (1992), Laird (1984a) and Lang (1993) examined the association of the experience of emotion and somatic changes. The current study will be compared to these studies in relation to the results of the study, the components of emotion examined, the stimulus used to elicit emotion and the use of the CSAQ-S.

4.4.1 Results of the Study

Krohne et al. (1992) predicted the level of emotional-congruence (though he did not use this term) from categorical traits. Emotional-congruence was therefore the dependant measure. The current study predicted the level of trait-somatic-anxiety (score on the CSAQ-S) from membership of categories of emotional-congruence. Congruence was therefore the independent measure. In a sense the design of this study was therefore the inverse of that of Krohne et al.. The results of this study indicated that for a number of versions of emotional-congruence, participants in the Under-

Reporter Group scored lower on the CSAQ-S. Also the mean score on the CSAQ-S tended to be higher for the Congruent Group. As with the study of Krohne et al. (1992), the relationship between an individual trait and emotional-congruence was supported.

The results of Laird (1984a) cannot be compared directly to those of the current study. Laird did not measure the experience of emotion per se. Whereas the research by Krohne et al. (1992) and the current study examined the relationship of somatic change and experience directly, Laird measured the accuracy of memory recall. Laird manipulated facial expression during exposure to emotionally relevant information. Participants were rated to be in the high or self produced cue group if their recall of the information was better when in a congruent emotional state. The results of Laird therefore did not directly address the experience of emotion.

The results of Laird (1984a) are consistent with the current study if considered within a theoretical framework of emotion. Within the Semantic Network Model of Emotion, the recall of emotionally congruent information that is associated with somatic change parallels emotional experience that is congruent with somatic change (Bower, 1981; Bower & Cohen, 1982; Gilligan & Bower, 1984). It is modelled that emotionally congruent information is held in association with an emotion type in the same way as an emotional experience. The association of recalled information and experienced emotion is therefore explained by the architecture of emotions. An individual's semantic network includes emotion nodes. These emotion nodes are connected to nodes representing somatic change though the strength of such connections or stems are variable. Laird's results may be explained by participants within the self-produced cue

group having a stronger stems or connections between emotion nodes and nodes representing somatic change. Similarly the results of the current study would suggest a group who have stronger stems or connections between emotion nodes and nodes representing somatic change. This group would have greater congruence and would generally experience a greater number of somatic changes associated with emotion or anxiety. As such an individual with a greater number of stem associations would tend to have a greater recall of emotionally congruent material and a greater experience of emotions when congruent with somatic change.

The current study and the study of Laird (1984a) used emotional-congruence, the strength of the association of somatic change and the experience of emotion during an experience of emotion, to predict general emotional functioning. Laird classified participants to one of two groups based on the strength of the association of facial expression and the experience of emotion. The strength of the association was found to predict the way the participant generally experienced emotion. The present study allocated participants on the basis on emotional-congruence. The Congruent Group was defined by a similarity of reports of emotional experience and the level of experience that would have been expected from the observed somatic changes. A parallel may be drawn between the Congruent Group in the present study who had an association of somatic change and the experience of emotion and Laird's Self-Produced Cue Group who had an association of somatic change and recalled information associated with an emotion.

The data supported that membership of the Congruent Group predicted general emotional functioning, trait-somatic-anxiety. In this study the score on the CSAQ-S indicated general emotional functioning. Members of the Congruent Group tended to have greater scores on the CSAQ-S than the Under-Reporter Group but did not differ from the Over-Reporter Group. This finding was similar to that of Laird that members of the Self-Produced Cue Group generally had greater experiences of emotion associated with bodily change.

The results found by Krohne et al. (1992) have also been interpreted within the Semantic Network Model of Emotion. One of the two groups identified by Krohne et al., the sensitiser group, has been associated with greater links to somatic changes. The cognitive network of the sensitiser group is described as highly differentiated and interconnected with a multitude of elements and associative linkages (Egloff & Krohne, 1996). Such a description of the associative links would seem equally applicable to Laird's self produced cue group or the Congruent Group in the present study.

The results of this study and those of Krohne et al. (1992) and Laird (1984a) suggest that some people have a stronger association of the experience of emotion and somatic change. In the current study this was indicated by a high emotional-congruence; a smaller discrepancy between reported experiences of emotion and the level of emotion predicted from somatic changes. This group was found to have higher trait-somatic-anxiety as indicated by higher scores on the CSAQ-S.

Lang (1993) examined the correlation between reports of displeasure and the perception of autonomic change with actual changes in facial expression and GSR. There was found to be a range of strengths of such correlations that were partially explained by sex differences. It was found that there was more likely to be a higher correlation for women of reports of displeasure and actual changes in facial expression than for men. Conversely there was more likely to be a higher correlation for men of reports of autonomic change with actual changes in GSR than for women participants. Such levels of correlation were not predicted for individuals.

Three key distinctions can be made between the methodology of this study and previous studies of emotional-congruence (Laird, 1984a; Krohne et al., 1992). The first was the measurement of both autonomic changes and changes to facial expression. The second was the use of a complex stimulus that elicited a range of emotion types. The third was the use of the CSAQ-S. Each of this distinctions will be discussed.

4.4.2 The Components of Somatic Change and Feedback

Somatic change as defined in the current study included both autonomic changes and changes to facial expression. Krohne and his colleagues (1978; 1986; Egloff & Krohne, 1996; Krohne et al., 1992) examined the relationship between experience and autonomic changes only. Group differences in the strength of the association of facial muscular changes and the experiences have also been demonstrated (Laird, 1984a; 1984b; Laird & Crosby, 1974; Laird et al., 1982). In such studies the role of autonomic changes were not examined. Both of these studies found significant results in relation

to one component only. This study therefore differed in that both facial and autonomic changes were examined.

While it would seem that individuals with high trait-somatic-anxiety have a greater emotional-congruence, the results do not infer the mechanism by which this emotional-congruence occurs. A number of mechanisms by which somatic changes may influence the experience of emotion have been proposed. These have ranged from physical mechanisms (Zajonc, 1980; Zajonc & Markus, 1984) to the perception (and misperception) of somatic changes (Valins, 1966). Changes have been modelled to occur in the blood (Lange, 1885/1922), the nasal cavity (Zajonc et al., 1989), the nerves of the face (Tomkins, 1962; Tomkins, 1963), the large cavities of the stomach (James, 1884; 1890) or areas of the brain (Arnold, 1960; Fridja, 1970; Fridja et al., 1989). Irrespective of the mechanism it would seem that the influence of this mechanism is not equal over the population.

4.4.3 The Stimulus of Emotion

While emotion has been observed to occur without any obvious environmental stimulus (Oatley, 1992; Oatley & Johnston-Laird, 1987), most experimental and quasi-experimental examinations of emotion use a specific stimulus to occasion the emotional response (for example, Lang, 1993; Schachter & Singer, 1962). The stimulus used in the present study differed substantially from that of either the studies of Krohne et al. (1992) or Laird (1984a). The stimulus used by Laird was manipulated somatic changes rather than the environmental stimulus. As is common in the field of facial feedback

research (Winton, 1986), Laird instructed participants to position their facial muscles in a specified way. Participants were then assigned to a self-produced cue group if their experience of emotion was congruent with their facial expressions at this time. The experience of emotion was therefore expected to be related to the facial expression rather than any environmental cue.

Krohne et al. (1992) used a simple stimulus. Participants were exposed to an aversive tone of 100 decibels for five minutes. Participants were unaware of the exact moment of the tone over the four trails. There was also a rest period at the beginning and end of the session. Emotion was measured using the aggregate of a tension scale. There was no measurement of different emotion types.

The stimulus used in this study was a video dramatisation of child abuse. Two factors should be considered when comparing the results of the current study to previous studies. First stimuli may require different levels of processing (Craik & Lockhart, 1972). A simple stimulus, such as a loud noise, may require minimal processing (Lewis & Michalson, 1983). Facial feedback is probably also hard-wired to experience (Izard, 1990) and therefore requires little processing. It is therefore probable that the stimulus used in the present study required significantly more processing than either that of Krohne et al. (1992) or Laird (1984a; 1984b).

The second factor is that the emotional experience of humans is varied and complex. Within a short period of time numerous emotions may be elicited which may or may not be continuous over that period (Lewis & Michalson, 1983). Emotions may

form stable links with other emotions (Izard, 1993) and the elicitation of one emotion may occasion another (Bower, 1981; Egloff & Krohne, 1996). The stimulus used in the present study was chosen to elicit a range of emotions, albeit within the negative range. The high mean score of sadness, anger and disgust supported this.

The range of responses was restricted within the designs of Krohne et al. (1992) or Laird (1984a; 1984b). In the study by Krohne et al. the range of responses was restricted by the simplicity of the stimulus and a uni-dimensional measure. There was no measurement of whether the level of stress elicited was associated with fear, anger or even a positive emotion. In the first condition of Laird's study, the facial expression of participants were manipulated into a facial expression of a single emotion and then compared to the experience of that emotion. Again there was no measurement of any other emotion type that may have either existed along side, competed with or replaced that emotion.

The examination of emotional responses within the context of a stimulus that elicits complex processing and a range of emotions, is both a strength and weakness of the design. The use of a stimulus that elicits complex processing and a range of emotions would appear to be a more accurate reflection of the usual emotional responses of humans (Lazarus, 1991; Lewis & Michalson, 1983). Given that there are a range of emotions involving a range components, all of which interact on a multitude of levels, the resulting responses to stimulus that elicits complex processing and a range of emotions, is more difficult to interpret.

While stimulus that elicits complex processing and a range of emotions would appear to be a more accurate reflection of the usual emotional responses of humans, such a stimulus does pose difficulties for the interpretation of data. From the data elicited, it is not possible to trace a particular response to the stimulus. It is also not possible to unravel the interaction of the various emotions and there components.

The stimulus used by Lang (1993) was probably closest to the current study in eliciting a range of emotions. Lang exposed participants to 21 emotionally evocative pictures including happy babies, grizzly mutilations and erotica. Asking participants to respond in terms of feelings of displeasure and arousal restricted the range of responses. There was no measurement of emotion types. Although the stimulus may have elicited a range of emotions, no data in relation to the differences between emotions was gathered.

4.4.4 The Cognitive Somatic Anxiety Questionnaire and Emotional-Congruence

Neither the studies of Krohne (1978; 1986), Krohne et al. (Egloff & Krohne, 1996; Krohne et al., 1992) nor Laird (1984a; 1984b) utilised the CSAQ-S. Krohne found that the association of GSR and the experience of emotion were related to coping style. Laird found the association of facial responses and emotion was associated with the way individual function in their daily lives. While such studies did not use the CSAQ-S or any measure of perceived somatic change as a trait measure, they did associate emotional-congruence with general functioning. The CSAQ-S had not

previously been compared to actual somatic and experiential changes during an emotion. Research with the CSAQ-S has predominantly looked at treatment effects (Kirkland & Hollandsworth, 1980; Schwartz et al., 1978). Such results indicate that individual differences that may be identified predict the association of somatic changes and the experience of emotion when a person is emotionally aroused.

The design used by Krohne et al. (1992) was, in a sense, the inverse of this design. Whereas the current study used categorical data in relation to participants' level of congruence to predict a trait measure (CSAQ-S), Krohne et al. used categorical data in relation to a trait measure to predict level of congruence. They differentiated two groups using the Mainz Coping Inventory. One of these groups, the sensitiser group, was found to have a greater association of the experience of emotion and autonomic change.

Neither Laird (1984a; 1984b) nor Lang (1993) used a trait measure of emotion. Laird differentiated groups by participants' recall of information during a single session. Such results may indicate general functioning, but this was not tested directly. Laird stated that groups were differentiated by their reported general experience of emotion, but this was not quantified. Lang measured the reliability of emotional responses across trials. The result that responses were reliable across trials is consistent with such results being associated with trait emotional functioning. This, however, was not directly tested. As such while the results of both Laird and Lang were consistent with individual differences in trait emotional functioning, neither used measures of trait functioning.

While the results of the current study supported previous examinations of trait predictors of emotional-congruence, the use of the CSAQ-S was a significant departure from previous predictors of emotional-congruence. The measure used by Krohne (1978; 1986) along with his colleagues (Egloff & Krohne, 1996; Krohne et al., 1992) identified two groups based the participants' style of coping with anxiety. These coping mechanisms were clustered into two factors: vigilance and cognitive avoidance. The differences in the association of somatic change and the experience of emotion were discriminated by the use of vigilant strategies. Such strategies included the recollection of past negative events, self-pity, information seeking, social comparison, planning, flight tendency, information control, anticipation of negative events and situational control. Each of these styles represented the participants' general way of coping with stress. Neither vigilance nor cognitive avoidance were specifically measures of trait emotional-congruence.

Most of the cognitive strategies associated with vigilance identified by Krohne (1978; 1986) along with his colleagues (Egloff & Krohne, 1996; Krohne et al., 1992) were cognitive strategies, unrelated to somatic changes. The exceptions to this were information seeking, flight tendency, information control and situational control. Information seeking may be considered to be associated with somatic change as it may involve the turning of one's attention to autonomic changes in order to interpret an event. Conversely information control may involve directing attention away from certain events in order to focus on salient factors. Salient factors may include or exclude somatic changes. Flight tendency and situational control may both be

associated with action tendencies (Fridja, 1970; 1987; Fridja et al., 1989) and therefore may be associated with somatic activity. The recollection of past negative events, self-pity, social comparison, planning and anticipation of negative events did not involve somatic factors. The trait measured by Krohne was different to the trait indicated by the CSAQ-S in that the measure defining the two groups had a minimal direct association with somatic change.

While some of the vigilant coping strategies as described by Krohne (1978; 1986) along with his colleagues (Egloff & Krohne, 1996; Krohne et al., 1992) may involve somatic changes or attention to somatic changes, the construct of coping style is clearly broader than this. It is unclear from the results of Krohne whether the association between coping style and congruence of somatic change and experience of emotion would be constant across all strategies. Strategies such as the recollection of past negative events, self pity, social comparison, planning and anticipation of negative events that do not involve somatic factors, may not be associated with somatic change. The results of the current study would be consistent with the association of emotional-congruence and strategies such as information seeking, flight tendency, information control and situational control. It is not clear that all vigilant strategies would have such an effect.

Even though there were significant differences between the two studies, both studies demonstrated that a group may be identified for whom there is a greater association of somatic change and the experience of emotion that others in the sample. It cannot be determined by the results of Krohne or the current study what proportion of

the two groups identified would be common if taken from the same sample. There may be significant intersection between the vigilant group of Krohne and the high trait-somatic-anxiety group of this study. It may be speculated that the two methods of identifying the group within the two studies represents the same underlying factor, but this would need to be determined by further research.

4.5 Limitations of the Study

Two limitations of this study have been identified. The first limitation of the study relates to the effect of the salience of particular emotions. The aim of the study was to examine the relationship of trait-somatic-anxiety and emotional-congruence. The measurement of emotional-congruence included that of the experience of emotion and somatic changes. It was shown that for some emotion types (anger, fear and sadness) difference in emotional-congruence (the under reporting of emotion) was related to trait-somatic-anxiety (lower scores on the CSAQ-S). This supported that differences in trait-somatic-anxiety were related to differences in emotional-congruence.

An alternative explanation for the association of trait-somatic-anxiety and emotional-congruence is that participants who experienced a greater number of intensity of somatic changes generally (CSAQ-S), also experienced emotions more acutely. Emotional-congruence was calculated from predictions of emotional experience from somatic change (see section 2.4.4). The prediction of an emotion from somatic change

was determined through a regression analysis using the whole sample. If low scorers on the CSAQ-S also scored lower on the measurement of the experience of an emotion type, the may appear to be under reporting because they are experiencing less of that emotion than the whole group. The individual is only Under-Reporting in comparison to a wider group that has a higher average score on that emotion. The result may therefore be a function of the experience of an emotion type not emotional-congruence.

For most of the emotion types examined in this study (anger, disgust, fear and shame), the experience of emotion and score on the CSAQ-S were not related. The mean score for sadness, however, significantly differed between high and low scorers on the CSAQ-S. It was therefore unclear as to whether the significant difference in trait-somatic-anxiety between groups when emotional-congruence was defined by facial expressivity and sadness would have occurred if groups had not differed in their raw experience of sadness. If people who scored low on the CSAQ-S were also more likely to experience more sadness irrespective of there somatic changes, the results of the study in relation to this version of emotional-congruence may not reflect a relationship between emotional-congruence and trait-somatic-anxiety.

The study found that the relationship between trait-somatic-anxiety and emotional-congruence was dependant upon the type of emotion experienced. A second limitation related to the use of the CSAQ-S to demonstrate differences in the emotional-congruence of emotion types. The stated aim of the study (see Section 1.1) was to examine whether people for whom bodily changes were more emotional-congruent during the experience of emotion subjectively identified bodily changes as generally

more salient during emotion. The CSAQ-S did not however determine whether people subjectively identified any bodily changes as generally more salient during emotion. The CSAQ-S only included a small number of bodily changes related to anxiety. For emotions such as shame and disgust, it unclear as to whether their congruence with somatic change is unrelated to trait-somatic symptoms or whether the emotional-congruence of shame and disgust is associated with different trait-somatic symptoms.

This may be illustrated by the example of disgust. The experience of disgust is associated with facial expression (Gross & Levenson, 1993; Scherer, 1992). It may well be that individuals may be grouped into under-reports of disgust compared to their facial expressivity, over reports of disgust in relation to their facial expressivity and a Congruent group. As such emotional-congruence may be predicted by disgust and facial expressivity. It would seem unlikely however that such groups would be predicted by the CSAQ-S. The CSAQ-S ask questions about individuals usual autonomic response to anxiety. The fact that general autonomic response to anxiety does not predict the reliability of the relationship of disgust and facial expressivity does not mean the relationship emotional-congruence of relationship is predictable. It may be expected that such a relationship would be more likely to be found if the CSAQ-S included items in relation to a broader range of emotion types and somatic changes.

The use of the CSAQ-S may have limited the findings in relation to some emotion types. If the CSAQ-S had of included item that was representative of a broader range of emotions, it would be expected that the results would not have been effected in relation to the versions of emotional-congruence related to fear and GSR. It may

however be expected that a significant result may have been found for other emotion types such as disgust or somatic changes such as facial expressivity. The use of the CSAQ-S may have produced false negative results in relation to these emotion types or somatic changes given the inventories bias to anxiety and somatic changes associated with autonomic change.

4.6. Further Considerations

Thus far the results have been discussed in the context of a theoretical model of emotion. The results of this study provided some limited support for a model of emotion that modelled individual variation in the association of somatic change and the experience of emotion. Three further considerations are to be discussed. The first is the implication of the direct data elicited in relation to the CSAQ-S. The second are the implications of the model in relation to practise. The third are possible directions of further research.

4.6.1 The Cognitive Somatic Anxiety Questionnaire

This study was the first to examine the relationship of the CSAQ-S with emotional-congruence. Neither the series of studies by Krohne (1978; 1986) along with his colleagues (Egloff & Krohne, 1996; Krohne et al., 1992) nor those by Laird (1984a; 1984b) used the CSAQ-S. Furthermore none of the studies using the CSAQ-S have compared the experience of emotion and somatic changes while participants are emotional. In examining the relationship between the CSAQ-S and actual emotional

responses, the current study went beyond previous research. This will be examined in section 4.6.1.1..

This study was also the first involving the CSAQ-S to move beyond general negative-emotion and fear and examine the relationship of the CSAQ-S to a range emotion types. The CSAQ-S was developed to examine differentiated responses to stressors. While it is recognised that a range or number of emotions may be elicited by a single stressor (Lazarus, 1991) and the experience of emotion may be labelled in a variety of ways (Izard, 1984; Russell, 1980; Smith, 1989), the CSAQ-S has only been applied to situations involving anxiety and fear. The results of the current study would suggest the CSAQ-S may (with further clarification) be a useful tool in the examination of anger and sadness though not with disgust or shame. This will be examined in section 4.6.1.2..

4.6.1.1. Validation Of The Cognitive Somatic Anxiety Questionnaire

The present results offer some support for the use of the CSAQ-S. There is some difficulty in demonstrating the discriminant validity of somatic anxiety when there is such a significant proportion of variance of anxiety that is common to both somatic and cognitive factors. This was supported by the results of a high correlation between the two scales of the CSAQ-S as well as a significant proportion of variance that was common to both scales of the CSAQ-S, the Beck Anxiety Inventory and the STAI.

As part of the analysis participants were divided into two groups based upon their scores on the CSAQ-S. Given that this questionnaire was a measurement of anxiety it may be reasonably questioned as to whether the difference between the groups could be explained by anxiety. It would seem to be improbable that the difference between the two groups could be explained by anxiety in general. While the CSAQ-S and STAI were found to be correlated, the two groups did not differ significantly on scores of the STAI.

From the results it appeared unlikely that emotional-congruence was a function of general anxiety. Three inventories of anxiety were administered to participants: the CSAQ-S , the trait sub-scale of the STAI and the Beck Anxiety Inventory. While the State Trait Inventory is a widely used and highly validated measure of anxiety, the inventory is associated with cognitive based rather than somatically based anxiety. This is consistent with no significant difference in the mean scores on the STAI of participants in each of the two groups being observed in this study.

The relationship between the Beck Anxiety Inventory and the CSAQ-S was clear. The high correlation between the CSAQ-S and the Beck Anxiety Inventory seemed to related to both scales indicating somatic symptoms of anxiety that have been stable over a period of time. The Beck Anxiety Inventory asks participants to respond to symptoms they have experienced over the past week as compared to the CSAQ-S that asks participants to respond to symptoms they generally experience. Both questionnaires seem to measure the responses of participants in relation to anxiety beyond their current state.

The study provided significant support for the CSAQ-S. The predictive power of the CSAQ-S of the relationship of the experience of emotion and somatic changes indicated a concurrent validity which adds to previous examinations of validity of the measures. Previous studies of the criterion-related validity of the measure have relied upon the predictive power of the CSAQ-S of treatment types. The validity of the CSAQ-S was further supported by the convergence of the measure with somatically based measures of anxiety and emotion such as the Autonomic Perception Questionnaire and Beck Anxiety Inventory but that it may be discriminated from cognitively based measures such as the STAI.

Previous studies of the CSAQ-S have examined the effect of somatic based therapies on the scores on the CSAQ-S (Kirkland & Hollandsworth, 1980; Schwartz et al.,1978). The validation of the CSAQ-S as a somatic measure was dependant upon somatic therapies having a greater effect than other therapies on the CSAQ-S as a dependant measure. Such studies of the CSAQ-S were limited in that they did not directly measure somatic changes. This study that participants who scored lower on the CSAQ-S tended to under-report emotion in some conditions. While there is no reason to suggest that somatic therapies would increase discrepancy, the results of the current study would suggest low scores on the CSAQ-S are consistent with higher discrepancy. Furthermore it should be noted that there was no measure of the CSAQ-S prior to participants undertaking the treatment nor were the groups randomly assigned. The results of this study would therefore cast doubt as to whether the CSAQ-S measured a lower level of emotion or a lower emotional-congruence.

4.6.1.2. Differentiated Emotion Types

The results of the study indicated that responses to the CSAQ-S could not be generalised across emotion types. Participant scores on the CSAQ-S predicted emotional-congruence for fear. To a degree the CSAQ-S was a reasonable predictor of emotional-congruence for anger and sadness. The scale did not, however, predict emotional-congruence for disgust or shame.

Results indicated that the CSAQ-S was a poor predictor of the association of somatic change and the experience of disgust or shame. The CSAQ-S does not contain any items in relation to disgust or shame (being a measure of anxiety). Given the evident structural differences of anxiety/fear and disgust (Garcia et al., 1985; Smith & Ellsworth, 1985), it may have been expected that the measure was not be a good predictor of disgust.

There are established measures of perceived somatic changes during an experience of other negative-emotions. The Autonomic Perception Questionnaire measures somatic changes associated with fear, anger and sadness. There is not, however, an established measure of such changes associated with disgust or shame. While just as there is significant common variance of the experience of negative-emotion (Watson & Clarke, 1984; 1992; Watson et al., 1984) there is also significant common variance in the somatic changes associated with positive emotions (Katkin, 1985; Mandler, 1975; Shields, 1984; 1991). There is, however, unique variance of

other negative-emotions (Shields, 1984) and this is probably equally true for disgust or shame.

4.6.2. Implications For Practise

Lang (1994) has identified that James' model (1884) of somatically occasioned emotion has been influential in the development of clinical models and treatment. He pointed out that Beck et al. (1988) suggest that panic attacks may result from misattribution of normal somatic changes as indicative of pathology (for example a heart attack) which occasions further anxiety. Psychopathology has also been associated with the abnormal association of labels with expressions of emotions (Lewis & Michalson, 1983) such as the association of an expression of fear with the label of anger or tiredness.

The current data would support the possibility of an individual having a greater propensity than another for somatically based experiences of emotion. The data indicated that some individuals could be categorised in a Congruent Group. It is unclear that this association between experience and somatic change would decrease such pathology as misattribution of normal somatic changes (Beck et al., 1988; Lewis & Michalson, 1983) but this would be consistent with the model.

A further implication of the model is that while an individual may have a greater propensity than another for somatically based experiences of emotion for one emotion, that such a propensity is not necessarily generalised across emotion types. The Under-

Reporter Group could be identified and predicted by the CSAQ-S when emotion was defined by general negative-emotion and either GSR or facial expressivity. When emotional-congruence was defined by specific emotion types, the relationship between the CSAQ-S and emotional-congruence was less clear. While a Under-Reporter Group could be identified and predicted by the CSAQ-S, this was the case for only three conditions: fear and GSR, anger and GSR and sadness and facial expressivity. In other conditions the CSAQ-S was not related to emotional-congruence.

The clinical utility of the model has also been indicated by studies using the CSAQ. A small body of literature has argued that treatments of anxiety have different efficacy depending upon whether anxiety is primarily cognitive or somatic. Schwartz et al. (Schwartz et al., 1978) found that exercise reduced reported somatic anxiety but had minimal effect on cognitive anxiety. Conversely meditation had a greater effect on cognitive anxiety than somatic anxiety. Similarly Kirkland and Hollandsworth (1980) found a cue control relaxation therapy had a greater effect on somatic anxiety than meditation. For both studies somatic and cognitive anxiety were differentiated by the CSAQ-S.

4.6.3. Further Research

Two areas of further research were identified. The first was in relation to the somatic components measured to calculate emotional-congruence. The second was the representation of sample in term of age and gender. Each are discussed below.

4.6.3.1.Components of Emotion

While emotions have been widely recognised as consisting of numerous components (see section 1.2), most studies have tended to focus on one component (for example Laird, 1984a; Montgomery & Jones, 1984; Schatcher & Singer, 1963) or a few related components (for example, Lang, 1979). A few notable exceptions have examined both facial expression and autonomic change (Lang, 1993; Levenson et al., 1991; Levenson et al., 1990). In the examination of emotional-congruence, this study included both facial expressivity and GSR. As such this study went beyond the usual limited examination of components.

It has been discussed that there are many components of emotion (section 1.2) and that these components may vary considerably (Kimble, 1990; Lacey et al., 1963). While the results of this study indicate the relationship of GSR and facial expressivity to emotional-congruence and in turn trait-somatic-anxiety, the results may not necessarily indicated the relationship of heart-rate or gross motor behaviours, for example, with emotional-congruence. The fact that this study found that the relationship emotional-congruence with trait-somatic-anxiety varied dependant upon the version being GSR or facial expressivity for fear, anger and sadness indicates that the relationship is dependant upon the type of somatic component. Further research is recommended to examine the relationship of emotional-congruence and trait-somatic-anxiety for other somatic components of emotion.

This study also did not examine the intake and processing components of emotion. The intake and processing components of emotion are essential components of emotion that have attracted much scientific examination (Mathews & McLeod, 1985). The intake and processing of information has also been associated with specific somatic changes (Fridja et al., 1989; Scherer, 1992). This study did not measure any of the initial cognitive processes. Given the multi-directional, multi-associative nature of emotion, such processes may affect the congruence of somatic changes and experience. Again further research is recommended to examine the effect of the intake and processing components of emotion on the relationship of emotional-congruence and trait-somatic-anxiety.

4.6.3.2 Considerations Regarding Participants

Most participants were females under 25 years of age. Twenty-seven of the 38 participants were female and aged between 18 and 24. From the perspective of demonstrating the association of emotional-congruence and trait-somatic-anxiety, the relative homogeneity of sample would reduce the likelihood that differences between the three groups (Under-Reporter Group, Congruent group and Over-Reporter Group) was affected by age.

Emotions are affected by aging and development (Harris, 1989; Izard, 1994; Lewis & Michalson, 1983; Saarni, 1979). Emotion has also been shown to vary as a function of gender (Lang, 1993). While the relative homogeneity of sample would support confidence in the findings in relation to females between the ages of 18 and 25

years, application of these finding outside of this population should therefore be treated with some caution. This study has largely controlled for the effect of age by having most participants within a narrow age range. While research suggests that older people may be more likely to experience emotion without somatic changes (Izard, 1990), this does not indicate different relationship of emotional-congruence and trait-somatic-anxiety.

It would be recommended that further research be undertaken to examine the relationship of emotional-congruence and trait-somatic-anxiety for older people and males. Given that the aging process is associated with greater cognitive control of emotional experience and less dependence on somatic changes (Harris & Katkin, 1975; Izard, 1993; Saarni, 1979), it may be expected that an older population would be associated with less emotional-congruence. There is no such indication that their would be a change in self-reported trait-somatic-anxiety associated with age. As such a sample of older people may indicate lower levels of emotional-congruence being associated with trait-somatic-anxiety.

4.7 Conclusion

The study examined the relationship of trait-somatic-anxiety and emotional-congruence, in particular the question are people who have high emotional-congruence at a time of viewing a provocative stimulus more likely to report a greater number of somatic symptoms of anxiety generally (trait-somatic-anxiety). Given that emotion may

be defined as either a general factor or specific emotion types the relationship of emotional-congruence and trait-somatic-anxiety was examined from two perspectives. First, the study examined whether people who have high emotional-congruence of somatic changes and general negative-emotion at a time of viewing a provocative stimulus were more likely to report somatic symptoms of anxiety (trait-somatic-anxiety). Second, the study examined whether people who have high emotional-congruence of somatic changes and individual emotion types (anger, disgust, fear, sadness and shame) at a time of viewing a provocative stimulus were more likely to report somatic symptoms of anxiety (trait-somatic-anxiety).

As expected it was found that those who under-reported general negative-emotion at a time of viewing a provocative stimulus were less likely to generally report somatic symptoms of anxiety (trait-somatic-anxiety). This was supported for both types of somatic change measured in the study: GSR and facial expressivity. There was only a minimal non-significant difference between those who accurately reported general negative-emotion and those who over reported general negative-emotion. This supported a relationship between emotional-congruence as observed and trait-somatic-anxiety as self-reported.

This study however went beyond the examination of emotion as general negative-emotion and examined specific emotion types. Such results indicated that when emotional-congruence was defined by fear and GSR and anger and GSR, the Under-Reporter Groups had substantially lower trait-somatic-anxiety than the Congruent Group. The Under-Reporter Groups had about half the mean score on the

CSAQ-S of than of the Congruent Group. In the other three versions of emotional-congruence involving GSR (disgust, sadness and shame) differences in trait-somatic-anxiety between Under-reporter and Congruent Groups were in the same direction but not significant. This study therefore indicated that while the Under-Reporter Group had lower trait-somatic-anxiety than the Congruent Group for general negative-emotion, this was only found in relation to fear and anger when emotion types were examined. There was no difference between groups when emotional-congruence was defined by disgust, sadness or shame.

Differences between Over-Reporter and Under-Reporter Groups were further differentiated by emotion types. Only when emotional-congruence was defined by fear was the difference between the Under-Reporter Group and the Over-Reporter Group significant; with substantially lower scores for Under-Reporter Group. Although not significant, differences between the Under-Reporter Groups and Over-Reporter Group were in the same direction for the other versions of emotional-congruence. Congruent and Over-Reporter Groups did not significantly differ for any of the five versions of emotional-congruence involve GSR.

In those results involving facial expression and emotion types, only when emotional-congruence was defined by sadness was the Under-Reporter Group significantly different to other groups. Post hoc tests revealed that when emotional-congruence was defined by sadness and facial expressivity, the Under-Reporter Group had a significantly lower trait-somatic-anxiety than either the Congruent Group or the Over-Reporter Group. This, however, is likely to be explained by the fact that

participants who tended to report a lower level of sadness than was indicated by their level of facial expressivity, tended to score lowly on the CSAQ-S. It may have been that those who scored lowly on the CSAQ-S tended to report a low level of sadness irrespective of facial expressivity. This is supported by the fact that there was a significant difference between high scorers and low scorers on the CSAQ-S in relation to sadness, but not any other emotion types as recorded by the Differential Emotions Scale.

The study therefore had two main findings. The first was that when emotional-congruence was defined generally, an under reporting of general negative-emotion predicted a general low level of trait-somatic-anxiety as measured by the CSAQ-S. Congruent and over-reporters were not, however, distinguished by their level of trait-somatic-anxiety in relation to general negative-emotion. The second finding was that while the emotional-congruence of general negative-emotion was related to trait-somatic-anxiety, this was not true for all emotion types. Once emotion types were treated more specifically, this effect was only true for fear and anger.

A small number of previous studies have found that people differ in their association of the experience of emotion and somatic changes and that such changes in emotional-congruence relate to their experience of daily life (Krohne et al., 1992; Laird 1984a). This study supported these findings found that such associations are dependant upon the type of somatic change and the type of emotion. The relationship of emotional-congruence and trait-somatic-anxiety varied dependant upon whether somatic change was measured as GSR or facial expressivity. The relationship of

emotional-congruence and trait-somatic-anxiety also varied dependant upon whether emotion was defined as general negative-emotion or one of the emotion types (anger, disgust, fear, sadness or shame)

The results indicated that trait-somatic-anxiety and observed emotional-congruence are related. The nature of this relationship is that people who are observed to under report the experience of emotion in the context of somatic changes, also report of lower number of somatic changes when generally anxious. Once emotion type is made more specific, however, the relationship varies. There is a relationship between trait-somatic-anxiety and observed emotional-congruence if emotional-congruence is defined by fear and GSR or anger and GSR or sadness and facial expressivity. There is no relationship under other conditions. Once emotion type is made more specific, an instruments such as the CSAQ-S that focus on anxiety and autonomic, is not predictive of other conditions, emotion types or somatic changes. It would appear that while trait-somatic-anxiety may reflect the relationship between emotions generally and somatic changes, the relationship of somatic change and specific emotion types may be dependant upon the type of emotion and somatic change identified in the trait measure.

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Appendices

A James Lange Hypothesis

James (1884) and Lange (1885/1922) proposed the proposition that somatic changes may lead to the experience of emotion late nineteenth century. The model was, however, later discredited when Cannon (1927) published a detailed criticism based on experimental work and neurological theory. Cannon argued that, rather than somatic changes leading to the experience of emotion, all components of emotion were an outflow of the thalamus, part of the forebrain.

While it is more than a century since the proposal of the James-Lange hypothesis, the work of James (1884; 1890), Lange (1885/1922) and subsequent criticisms by Cannon (1929; 1927; 1931; 1932) will be examined for a number of reasons. First the theories of James and Lange were seminal in the area of emotion psychology and have greatly influenced subsequent theories (Lang, 1994). Second the James-Lange hypothesis proposed a model of emotion based upon somatic change whereas Cannon argued somatic change was a reflection of emotion. This distinction reflects continuing debated in emotion literature. An example of this is facial expression being a output of emotion (Buck, 1984; Ortony, Clore, & Collins, 1988; Ortony, Clore, & Foss, 1987) or facial feedback resulting in the experience of emotion (Laird, 1984; Strack, Martin, & Streeper, 1988). Another example is emotion being defined by somatic changes (Zajonc, 1980; 1984) or cognitive patterns (Lazarus, 1984).

Third following Cannon's criticism of the James-Lange hypothesis, there was little examination of somatic change in emotion for the following three decades. A theory of emotional experience affected by somatic change was not considered tenable until integrated with modern cognitive theory in the mid 1960's (Delgado, 1966; Harris & Katkin, 1975; Schachter & Singer, 1962). It was not until there were significant developments in both cognitive science and neuroscience that the contribution of somatic changes to emotional experience was appreciated. The current study did not test whether somatic changes such as facial expression and autonomic activity may lead to the experience of emotion. A model of somatic change effecting the experience of emotion was established by the James-Lange hypothesis and has been supported by subsequent theory and experimental evidence. Given that the study assumed that somatic changes may lead the experience of emotion, such subsequent theory and experimental evidence was examined. Furthermore, given that such a model was criticised by Cannon (1927), a rationale rejecting Cannon's criticisms was also given.

Before the work of William James (1884) and Carl Lange (1885/1922), a commonsense argument prevailed that the experience of emotion lead to somatic changes. That is to say changes such as increased heart rate and movement of the muscles involved with facial expression were caused by the experience of emotion: people smile because they feel happy, their hearts pound fast because they feel scared. In contrast to the common belief, William James (1884) argued that emotion began in the peripheral nervous system and flowed to the central nervous system where the experience of the emotion entered conscious experience. James suggested that such

changes may include the large internal organ regions of the peripheral nervous system (Schachter, 1966; Schachter & Singer, 1962) although he was not specific about the exact form of somatic change that lead to the experience of emotion (Lang, 1994). The large internal organs, in particular the abdominal cavity, were called the visceral regions. James described a range of changes to the somatic regions that were associated with somatic change (Lang, 1994). Bodily or somatic changes then occasioned subjective emotional experience.

Carl Lange (1885/1922) proposed a similar theory, although he emphasised changes in the vascular system as the primary causal factor. The vascular system are those vessels within the body that conduct and circulate bodily fluids. It was unclear how such changes determined emotional experience, however, it was proposed that increased flow in systems such as the blood were associated with increased emotional experience. Lange was specific in his model of how such changes to the peripheral nervous system lead to experience, identifying the vasomotor centre on the brain stem as the pathway between somatic change and the experience of emotion (Lang, 1994).

Both theories, referred to collectively as the James-Lange hypothesis continue to be highly influential more than a century after they were proposed (Lang, 1994). At the turn of the twentieth century, emotion had become totally equated with peripheral activity (Mandler, 1975). While the peripheral changes associated with emotion initially identified were changes to internal organs and the circulation of fluid, somatic change later also became associated with the muscular movements associated with facial expression and the gross motor activity involved in behaviour.

While the work of James and Lange has become fused into what is commonly called the James-Lange hypothesis, there are considerable differences between the two theories. James (1884; 1890) was principally concerned with the experience of emotion and based his theory on introspective philosophical methods (Lang, 1994). By contrast Lange as a physiologist was interested in emotion as principally a cardiovascular event. Lange did not differentiate the categories of emotional experience, such as joy and anger, because it was the physiological change and not the experiential change that was of principle concern to Lange (1885/1922; Lang, 1994). In the light of recent theoretical differences on the question of basic emotions it should be noted that although James was concerned about the quality of experience and described experiences in detail, he did not assume fixed categories of emotion. James referred to emotional experience as varied as "… the shape of rocks on a New Hampshire farm." and therefore not amenable to clear categories (Lang, 1994). The writings of James did, however, seem to reflect a greater emphasis on the types of emotion as compared to that of Lange.

Given the differences in the theories of James and Lange, careful consideration needs to be given to the meaning of the general term, the James-Lange hypothesis. The commonality of the two theories was the assertion that somatic changes (as a broad construct) cause the experience of emotion (as a broad construct). There is marked variation between the theories as to the definition of emotion, the range of somatic changes and the mechanism of association between the two. James (1884) in fact clearly stated that he believed that it was probable that no specialised centres of the

brain or pathways associated with emotion (Lang, 1994). As such the James-Lange hypothesis as the union of the two theories should not be considered to assume any position on the mechanism by which somatic change leads to the experience of emotion.

In Cannon's classic text *Bodily changes in pain, hunger, fear and rage* (1927), he presented a comprehensive criticism of the James-Lange hypothesis. The effect of this criticism was to render the James-Lange hypothesis as untenable for the next three decades. The James-Lange hypothesis was criticised on two fronts. First it was argued that a neurologically centred account of emotion, in which both experiential and somatic changes emanated from the central nervous system, was more probable. Secondly, it was argued that the viscera were considered incapable of eliciting emotion. These two assertions were supported by a range of evidence.

Much of Cannon's criticism was directed at the mechanism of feedback from somatic change to the experience of emotion. The criticism of the James-Lange model questioned whether feedback from the viscera, that is feedback from the large internal organs associated with autonomic activity, lead to emotional experience. The ability of the viscera to elicit the experience of emotion was challenged when it was shown animals without the capacity for visceral feedback continued to display emotional expression. The brain structures of cats were altered to remove the capacity for visceral feedback. The procedure involved separating the cortex, which is part of the cerebrum,

from the viscera[3]. This was done by complete transections as well as lesions (Cannon, 1927; 1929; 1931; 1932; Bard, 1928; 1934). It was found that following this procedure that cats continued to be able to express emotion (in particular fear/anxiety) through avoidance. Cannon argued that the experience of emotion was therefore not dependent on the perception of visceral arousal.

Some concerns have been raised about the validity of Cannon's operationalisation of the constructs. Subsequent research has supported the association of emotional experience with the cerebral cortex (Plutchik, 1991; 1994; Pribram, 1981). While the association of emotional experience with the cerebral cortex seems reasonable, the equating of emotional experience with avoidance does not. Even if it is accepted that experimental work with cats is a valid indicator of the emotions of humans, the procedure described measured the expression rather than the experience of emotion. The procedure demonstrated that the removal of parts of the brain associated with changes to autonomic arousal did not inhibit a behavioural expression generally associated with fear (Harris & Katkin, 1975).

[3]The brain structures of both humans and cats may be divided into three regions: the hindbrain, the midbrain and the forebrain. Within forebrain further areas may be differentiated: (1) cerebrum (including outer layer called the cerebral cortex) (2) hypothalamus (3) thalamus (4) the hippocampus and (5) amygdala (Maclean, 1990).

The result of the experimental work reported above was interpreted to indicate that the changes associated with emotion, both somatic and experiential, were independently occasioned by changes within the central nervous system. Specifically all changes associated with emotion were considered to be the general outflow from the limbic system. This centralised theory of emotion later became known as Psychophysiological Arousal Theory (Duffy, 1957; Hebb, 1958; Malmo, 1959). Somatic changes were considered to be occasioned by the limbic system through the thoracic and lumbar parts of the spinal chord and sympathetic ganglia during times of emergency. The experience of emotion was also modelled as dependent on the association of either the thalamus (Cannon, 1927; 1931) or hypothalamus (Bard, 1928; 1934) within the cerebral cortex. The limbic system, which includes both the thalamus and hypothalamus, therefore had two independent functions. The first was associated with arousal of the autonomic nervous system. The second was to relay information back to the cortex, which is associated with the experience of emotion. The relationship between arousal and experience was explained in terms of a common association with the limbic system[4].

[4]The above discussion of Psychophysiological Arousal Theory is a simplification of the model which ignores the differential roles of the thalamus and hypothalamus, the refining of the model between the late 1920's and early 1960's and the flaws in the model demonstrated by current neurological theory. For a discussion of these issues see the review by Pribram (1981).

The fundamental criticism of the James-Lange hypothesis was therefore that the hypothesis was not consistent with neurological theory at that time. Specifically it was argued that the area responsible for experience, the cortex, was not participant to stimulation from somatic regions. The criticism may therefore be reviewed in the context of subsequent theory (Delgado, 1966; Lang, 1994; Plutchik, 1994). Perhaps the neurophysiological theory that has most directly addressed the role of somatic changes in eliciting emotional experience has been Delgado's theory of the Fragmental organisation of behaviour. Delgado (1966) compared electrical stimulation of three types of area of the brain. The first type produced no observable effects that are associated with emotion. The second produced behavioural or autonomic changes associated with emotion but did not produce any subjective experience of emotion. The third type produced both behavioural/autonomic changes and subjective experience. No area of the brain was found to produce emotional experience without behavioural/autonomic change. A position that somatic and experiential components of emotion are independent, therefore, would seem unlikely.

Cannon’s criticism examined the mechanism of feedback from somatic change to the experience of emotion. Given that the criticism is based on the mechanism of feedback, this criticism is more relevant for the Lange version of the hypothesis. As the focus of James’ thesis was not the physiology of emotion, the findings of Cannon in relation to James seems to be a mute point. The Jamesian model identified the activation of somatic change as a salient feature of emotion (Lang, 1994). The feedback

from somatic change was considered to occur directly via neural receptors, but this was not the central tenet of the thesis.

The model proposed by James was further criticised for being dependent upon the viscera having the capacity to signal emotions. It was argued the viscera were slow and insensitive. Given that emotional experience occurs quickly following perception of a stimulus, and needs to occur quickly if emotions are to facilitate an immediate response, then the slow response of the viscera would be too slow (Cannon, 1927). Furthermore, the viscera were not sensitive enough to contribute to an individual's recognition of their emotions. Parts of the viscera are so sparse in nerve fibres that they can be cut without anaesthetic. It may be argued that such a lack of sensation is inconsistent with the role of the viscera as a signal for emotional changes.

The range of emotions was considered to be inconsistent with the binary feedback from the viscera. Changes to viscera were the same for rage, fear, fever and joy. It was argued that any approach to emotions that exclusively focuses on the autonomic system was questionable, in that a bipolar division of the nervous system does not adequately differentiate the many varieties of emotion. Specifically the autonomic nervous system may be divided into sympathetic and parasympathetic systems. It is certainly true that fear, rage and excitement are all characterised by the activation or arousal of the sympathetic nervous system, but they are considered to be very different emotions. Furthermore, if visceral changes were the sole causal agent of emotional experience, then it remains unclear as to how emotions associated with identical visceral changes are differentiated.

Experimental work prior to 1960 utilising artificial methods of inducing visceral changes associated with emotion did not produce the experience of emotion. Cannon (1927) used the injection of adrenaline and other methods of inducing visceral changes and found that this did not produce the experience of emotion in people. It was reasoned that if visceral changes were the cause of emotions, then the manipulation of the viscera in isolation should produce the emotion. Cannon claimed that his results therefore disputed visceral changes as a causal agent and that somatic changes were therefore secondary to limbic activity.

By the early 1970's a greater appreciation had developed that emotional experience was dependent upon multiple interacting processes. With the development of cognitive theory, Schachter and Singer (1962) argued that the James-Lange hypothesis may be valid if it included cognitive factors. Schachter and Singer proposed that arousal of the autonomic nervous system was the undifferentiated basis of emotion. In doing so Schachter and Singer addressed criticisms that artificial methods of inducing visceral changes associated with emotion did not produce the experience of emotion, and that changes to viscera are the same for same for a range of emotions. It was proposed that perception of the autonomic nervous system by the individual, combined with a cognitive interpretation of the situation, produced emotional experience. Such a model identified two concurrent processes: the cognitive appraisal of the situation and perception of the arousal of one's own somatic change. An example of the integration of these two processes may be “I feel aroused” and “I see an object

that may do me harm", therefore "I am afraid". The autonomic nervous system therefore regulated the experience of emotion.

By modelling somatic factors to interact with cognitive factors, the criticisms that the viscera were too slow and that the experience of emotion remained when visceral feedback was ceased were also addressed. Harris and Katkin (1975) postulated the existence of secondary emotions. Secondary emotions, as defined by Harris and Katkin, are the cognitive association of a stimulus with the expectation of subsequent visceral arousal. Through a process of learning, the experience of fear or anger may therefore be produced in expectation of autonomic arousal. Thus in a similar fashion to classical conditioning, Cannon's cats may produce an emotional expression even if the expected stimulus of visceral arousal is not perceived. As such a process would be immediate, this process would also address criticisms that visceral feedback was too slow to explain immediate emotional experiences.

The experimental results of Schachter and Singer (1962) demonstrated that role of perception in differentiating between emotions once the autonomic nervous system was aroused. In the experimental procedure arousal was manipulated directly. The appraisal process related to the interpreting of external stimuli was indirectly manipulated by exposing participants to either another person who was joyful or angry. In this study the appraisal process did not occasion the arousal. It was found that appraisal in conjunction with the arousal occasioned the experience of emotion.

Within the framework of the three component model of emotion, the James-Lange hypothesis is consistent with the influence of somatic components on the experiential components of emotion. The findings of Schachter and Singer (1962) and Harris and Katkin (1975) support the influence of somatic components on the experiential components of emotion but also emphasis the role of initial cognitive processes. This model is therefore consistent with the association of somatic change and the experience of emotion that forms the basis of the study.

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B Age of Participants

Age	Number of Cases
18 to 24 years	27
25 to 31 years	3
32 to 38 years	1
39 to 45 years	4
46 to 52 years	2
53 to 59 years	1
60 years or greater	0

C Correlation between inventories of anxiety

	Correlation between inventories		
	CSAQ: Somatic	STAI: Trait	Beck Anxiety Inventory
CSAQ: Somatic		.53[c]	.64[c]
STAI: Trait	.53[c]		.65[c]
Beck Anxiety Inventory	.64[c]	.65[c]	
CSAQ-C	.80[c]	.68[c]	.67
APQ[d]: Fear	.59[c]	.22	.22
APQ[d]: Anger	.68[c]	.25	.32[a]
APQ[d]: Sadness	.55[c]	.33[a]	.49[b]

[a] p>.05,

[b] p>.01,

[c] p>.001

[d] Version of the Autonomic Perception Questionnaire

D Mean scores on CSAQ-S by Groups

D-1 Fear

		Congruence group: fear		
		Over reporter	Under reporter	Congruent
Groups calculated from GSR and fear				
	Mean	20.29	11.89	24.93
	SD	7.80	3.50	5.34
Groups calculated from facial responsivity and fear				
	Mean	21.70	16.92	22.81
	SD	6.78	9.01	6.88

D-2 Shame

		Congruence group: shame		
		Over reporter	Under reporter	Congruent
Groups calculated from GSR and shame				
	Mean	22.25	17.00	21.00
	SD	7.41	7.88	7.76
Groups calculated from facial responsivity and shame				
	Mean	23.09	16.50	21.90
	SD	7.15	8.46	6.85

D-3 Anger

		Congruence group: anger		
		Over reporter	Under reporter	Congruent
Groups calculated from GSR and anger				
	Mean	19.80	13.22	23.58
	SD	7.21	3.42	7.59
Groups calculated from facial responsivity and anger				
	Mean	21.20	15.70	23.58
	SD	7.73	8.49	6.39

D-4 Disgust

		Congruence group: disgust		
		Over reporter	Under reporter	Congruent
Groups calculated from GSR and disgust				
	Mean	19.00	18.08	22.00
	SD	7.80	8.40	7.39
Groups calculated from facial responsivity and disgust				
	Mean	21.11	16.78	22.00
	SD	8.51	8.86	6.76

D-5 Sadness

		Congruence group: sadness		
		Over reporter	Under reporter	Congruent
Groups calculated from GSR and sadness				
	Mean	22.45	15.73	21.56
	SD	8.53	6.91	7.03
Groups calculated from facial responsivity and sadness				
	Mean	22.45	14.00	22.57
	SD	8.55	4.83	6.81

E Analysis of Variance of Multiple Emotions

E-1 Fear

E-1.1 The Congruence of the Experience of Fear and GSR

E-1.1 (i) Between-Subjects Factors

	Groups	*N*
The Congruence Of The Experience Of Fear And GSR	Under Reporters	9
	Congruent Group	15
	Over Reporters	14

E-1.1 (ii) Tests of Between-Subjects Effects

Dependent Variable: CSAQ-S

Source	Type III Sum of Squares	df	Mean Square	*F*	*p* (Sig)
Corrected Model	957.66[a]	2	478.83	12.925	.000
Intercept	13086.81	1	13086.81	353.240	.000
CA3	957.66	2	478.83	12.925	.000
Error	1296.68	35	37.05		
Total	17655.00	38			
Corrected Total	2254.34	37			

[a] R Squared = .425 (Adjusted R Squared = .392)

E-1.1 (iii) Post Hoc Test of Multiple Comparisons: Tukey HSD

Dependent Variable: CSAQ-S

Independent Variable (IV): The Congruence Of The Experience Of Fear And GSR

Tukey HSD

(I) IV	(J) IV	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval (I) IV	95% Confidence Interval (J) IV
Under Reporters	Congruent Group	-13.04	2.56	.000	-19.32	-6.76
	Over Reporters	-8.39	2.60	.007	-14.76	-2.03
Congruent Group	Under Reporters	13.04	2.56	.000	6.76	19.32
	Over Reporters	4.64	2.26	.110	-.89	10.18
Over Reporters	Under Reporters	8.40	2.60	.007	2.03	14.76
	Congruent Group	-4.65	2.26	.114	-10.18	.89

Note: Based on observed means. The mean difference is significant at the .05 level.

E-1.2 The Congruence Of The Experience Of Fear And Facial Expressivity

E-1.2 (i) Between-Subjects Factors

	Groups	*N*
The Congruence Of The Experience Of Fear And GSR	Under Reporters	9
	Congruent Group	15
	Over Reporters	14

E-1.2 (ii) Tests of Between-Subjects Effects

Dependent Variable: CSAQ-S

Source	Type III Sum of Squares	df	Mean Square	*F*	*p* (Sig).	Source
Corrected Model	957.66[a]	2	478.83	12.93	.000*	957.66[a]
Intercept	13086.81	1	13086.81	353.24	.000	13086.81
CA3	957.66	2	478.83	12.93	.000	957.66
Error	1296.68	35	37.05			1296.68
Total	17655.00	38				17655.00

a R Squared = .080 (Adjusted R Squared = .019)

E-2 Anger

E-2.1 (i) The Congruence of the Experience of Anger and GSR

E-2.1 (ii) Between-Subjects Factors

	Groups	*N*
The Congruence Of The Experience Of Anger And GSR	Under Reporters	9
	Congruent Group	19
	Over Reporters	10

E-2.1 (iii) Tests of Between-Subjects Effects

Dependent Variable: CSAQ-S

Source	Type III Sum of Squares	df	Mean Square	*F*	*p* (Sig).	Source
Corrected Model	656.55[a]	2	328.28	7.19	.002	656.55[a]
Intercept	12147.04	1	12147.04	266.09	.000	12147.04
CA3	656.55	2	328.28	7.19	.002	656.55
Error	1597.79	35	45.65			1597.79
Total	17655.00	38				17655.00

[a] R Squared = .080 (Adjusted R Squared = .019)

E-2.1 (iv) Multiple Comparisons: Tukey HSD

Dependent Variable: CSAQ-S

Independent Variable (IV): The Congruence Of The Experience Of Anger And GSR

(I) IV	(J) IV	Mean Difference (I-J)	Std. Error	*p* (Sig)	95% Confidence Interval (I) IV	95% Confidence Interval (J) IV
Under Reporters	Congruent Group	-10.36	2.73	.002	-17.05	-3.67
	Over Reporters	-6.58	3.10	.101	-14.18	1.02
Congruent Group	Under Reporters	10.36	2.73	.002	3.66	17.05
	Over Reporters	3.78	2.64	.336	-2.68	10.24
Over Reporters	Under Reporters	6.58	3.10	.101	-1.02	14.18
	Congruent Group	-3.78	2.64	.336	-10.24	2.68

Note: Based on observed means.

E-2.2 The Congruence of the Experience of Anger and Facial Expressivity

E-2.2 (i) Between-Subjects Factors

	Groups	*N*
The Congruence Of The Experience Of Anger And Facial Expressivity	Under Reporters	10
	Congruent Group	13
	Over Reporters	10

E-2.2 (ii) Tests of Between-Subjects Effects

Dependent Variable: CSAQ-S

Source	Type III Sum of Squares	df	Mean Square	*F*	*p* (Sig).	Source
Corrected Model	331.33[a]	2	165.66	2.97	.067	331.33[a]
Intercept	13056.73	1	13056.73	233.71	.000	13056.73
CA3	331.33	2	165.66	2.96	.067	331.33
Error	1676.01	30	55.87			1676.01
Total	15651.00	33				15651.00

[a] R Squared = .080 (Adjusted R Squared = .019)

E-3 Disgust

E-3.1 The Congruence Of The Experience Of Disgust And GSR

E-3.1 (i) Between-Subjects Factors

	Groups	*N*
The Congruence Of The Experience Of Disgust And GSR	Under Reporters	12
	Congruent Group	18
	Over Reporters	8

E-3.1 (ii) Tests of Between-Subjects Effects

Dependent Variable: CSAQ-S

Source	Type III Sum of Squares	df	Mean Square	*F*	*p* (Sig).	Source
Corrected Model	123.42[a]	2	61.71	1.01	.373	123.43[a]
Intercept	13228.46	1	13228.45	217.28	.000	13228.45
CA3	123.43	2	61.71	1.01	.373	123.43
Error	2130.92	35	60.88			2130.92
Total	17655.00	38				17655.00

a R Squared = .080 (Adjusted R Squared = .019)

E-3.2 The Congruence Of The Experience Of Disgust And Facial Expressivity

E-3.2 (i) Between-Subjects Factors

	Groups	*N*
The Congruence Of The Experience Of Disgust And Facial Expressivity	Under Reporters	9
	Congruent Group	15
	Over Reporters	9

E-3.2 (ii) Tests of Between-Subjects Effects

Dependent Variable: CSAQ-S

Source	Type III Sum of Squares	df	Mean Square	*F*	*p* (Sig)	Source
Corrected Model	160.89[a]	2	80.44	1.31	.286	160.89[a]
Intercept	12415.43	1	12415.43	201.72	.000	12415.43
CA3	160.89	2	80.44	1.31	.286	160.89
Error	1846.44	30	61.55			1846.44
Total	15651.00	33				15651.00

[a] R Squared = .080 (Adjusted R Squared = .019)

E-4 Shame

E-4.1 The Congruence Of The Experience Of Shame And Galvanic Skin Response

E-4.1 (i) Between-Subjects Factors

	Groups	*N*
The Congruence Of The Experience Of Shame And GSR	Under Reporters	12
	Congruent Group	14
	Over Reporters	12

E-4.1 (ii) Tests of Between-Subjects Effects

Dependent Variable: CSAQ-S

Source	Type III Sum of Squares	df	Mean Square	*F*	*p* (Sig)	Source
Corrected Model	182.09[a]	2	91.05	1.54	.229	182.09[a]
Intercept	15246.26	1	15246.26	257.51	.000	15246.26
CA3	182.09	2	91.05	1.54	.229	182.09
Error	2072.25	35	59.21			2072.25
Total	17655.00	38				17655.00

[a] R Squared = .080 (Adjusted R Squared = .019)

E-4.2 The Congruence Of The Experience Of Shame And Facial Expressivity

E-4.2 (i) Between-Subjects Factors

	Groups	*N*
The Congruence Of The Experience Of Shame And Facial Expressivity	Under Reporters	12
	Congruent Group	10
	Over Reporters	11

E-4.2 (ii) Tests of Between-Subjects Effects

Dependent Variable: CSAQ-S

Source	Type III Sum of Squares	df	Mean Square	*F*	*p* (Sig)	Source
Corrected Model	284.52[a]	2	142.26	2.48	.101	284.52[a]
Intercept	13787.55	1	13787.55	240.09	.000	13787.55
CA3	284.52	2	142.26	2.48	.101	284.52
Error	1722.81	30	57.43			1722.81
Total	15651.00	33				15651.00

[a] R Squared = .080 (Adjusted R Squared = .019)

E-5 Sadness

E-5.1 The Congruence Of The Experience Of Sadness And Galvanic Skin Response

E-5.1 (i) Between-Subjects Factors

	Groups	*N*
The Congruence Of The Experience Of Sadness And GSR	Under Reporters	11
	Congruent Group	16
	Over Reporters	11

E-5.1 (ii) Tests of Between-Subjects Effects

Dependent Variable: CSAQ-S

Source	Type III Sum of Squares	df	Mean Square	*F*	*p* (Sig)	Source
Corrected Model	305.50[a]	2	152.75	2.74	.078	305.50[a]
Intercept	14609.57	1	14609.57	262.38	.000	14609.57
CA3	305.50	2	152.75	2.74	.078	305.50
Error	1948.85	35	55.68			1948.85
Total	17655.00	38				17655.00

[a] R Squared = .080 (Adjusted R Squared = .019)

E-5.2 The Congruence of the Experience of Sadness and Facial Expressivity

E-5.2 (i) Between-Subjects Factors

	Groups	*N*
The Congruence Of The Experience Of Sadness And Facial Expressivity	Under Reporters	10
	Congruent Group	14
	Over Reporters	11

E-5.2 (ii) Tests of Between-Subjects Effects

Dependent Variable: CSAQ-S

Source	Type III Sum of Squares	df	Mean Square	*F*	*p* (Sig)	Source
Corrected Model	518.58[a]	2	259.29	5.38	.010	518.59[a]
Intercept	13280.84	1	13280.84	275.58	.000	13280.84
CA3	518.59	2	259.29	5.38	.010	518.59
Error	1542.16	32	48.19			1542.16
Total	16181.00	35				16181.00

[a] R Squared = .080 (Adjusted R Squared = .019)

E-5.2 (iii) Post Hoc Test of Multiple Comparisons: Tukey HSD

Multiple Comparisons

Dependent Variable: CSAQ-S

Independent Variable (IV): The Congruence Of The Experience Of Anger And GSR

(I) IV	(J) IV	Mean Difference (I-J)	Std. Error	*p* (Sig).	95% Confidence Interval (I) IV	(J) IV
Under Reporters	Congruent Group	-8.57	2.87	.015	-15.64	-1.51
	Over Reporters	-8.46	3.03	.023	-15.91	-1.00
Congruent Group	Under Reporters	8.57	2.87	.015	1.51	15.64
	Over Reporters	.12	2.80	.99	-6.76	6.99
Over Reporters	Under Reporters	8.46	3.03	.02	1.00	15.91
	Congruent Group	-.12	2.80	.99	-6.99	6.76

Note: Based on observed means. The mean difference is significant at the .05 level.

F Analysis of Variance of Negative Emotion

F-1 The Congruence of the Experience of Negative Emotion and GSR

F-1.1 Between-Subjects Factors

	Groups	*N*
The Congruence Of The Experience Of Negative Emotion And GSR	Under Reporters	10
	Congruent Group	15
	Over Reporters	11

F-1.2 Tests of Between-Subjects Effects

Dependent Variable: CSAQ-S

Source	Type III Sum of Squares	*df*	Mean Square	*F*	*p* (Sig)	Source
Corrected Model	498.68[a]	2	249.34	5.15	.011	498.68[a]
Intercept	13835.65	1	13835.65	285.74	.000	13835.65
CA3	498.68	2	249.34	5.15	.011	498.68
Error	1597.88	33	48.42			1597.88
Total	17062.00	36				17062. 00

[a] R Squared = .080 (Adjusted R Squared = .019)

F-1.3 Post Hoc Test of Multiple Comparisons: Tukey HSD

Multiple Comparisons

Dependent Variable: CSAQ-S

Independent Variable (IV): The Congruence Of The Experience Of Anger And GSR

(I) IV	(J) IV	Mean Difference (I-J)	Std. Error	*p* (Sig)	95% Confidence Interval	
					(I) IV	(J) IV
Under Reporters	Congruent Group	-8.53	2.84	.014	-15.50	-1.56
	Over Reporters	-7.96	3.04	.034	-15.42	-.50
Congruent Group	Under Reporters	8.53	2.84	.014	1.56	15.50
	Over Reporters	.57	2.76	.977	-6.20	7.35
Over Reporters	Under Reporters	7.96	3.04	.034	.50	15.42
	Congruent Group	-.57	2.76	.977	-7.35	6.24

Note: Based on observed means. The mean difference is significant at the .05 level.

F-2 The Congruence of the Experience of Negative Emotion and Facial Expressivity

F-2.1 Between-Subjects Factors

	Groups	*N*
The Congruence Of The Experience Of Negative Emotion And Facial Expressivity	Under Reporters	8
	Congruent Group	14
	Over Reporters	9

F-2.2 Tests of Between-Subjects Effects

Source	Type III Sum of Squares	*df*	Mean Square	F	*p* (Sig)	Source
Corrected Model	553.67[a]	2	276.83	6.00	.007	553.67[a]
Intercept	11548.40	1	11548.40	250.39	.000	11548.40
CA3	553.67	2	276.83	6.00	.007	553.67
Error	1291.43	28	46.12			1291.43
Total	15058.00	31				15058.00

[a] R Squared = .080 (Adjusted R Squared = .019)

F-2.3 Post Hoc Test of Multiple Comparisons: Tukey HSD

Multiple Comparisons

Dependent Variable: CSAQ-S

Independent Variable (IV): The Congruence Of The Experience Of Anger And GSR

(I) IV	(J) IV	Mean Difference (I-J)	Std. Error	*p* (Sig)	95% Confidence Interval (I) IV	(J) IV
Under Reporters	Congruent Group	-9.93	3.01	.007	-17.38	-2.49
	Over Reporters	-9.17	3.30	.025	-17.3320	-1.00
Congruent Group	Under Reporters	9.93	3.01	.007	2.49	17.38
	Over Reporters	.77	2.90	.963	-6.42	7.94
Over Reporters	Under Reporters	9.17	3.30	.025	1.00	17.33
	Congruent Group	-.76	2.90	.963	-7.94	6.42

Note: Based on observed means. The mean difference is significant at the .05 level.

G Scores on the Differential Emotions Scale

G-1 Means

Emotion Type	Mean Score	*SD*
Anger	43.72	7.92
Disgust	43.17	8.98
Fear	32.50	12.33
Sadness	44.00	11.99
Shame	31.83	11.99

G-2 Comparison with the CSAQ-S

	High CSAQ-S Group		Low CSAQ-S Group		*F*	*DF*	Significance
Anger	46.06	(6.9)	41.85	(8.54)	3.96	(1, 36)	not significant
Disgust	44.69	(7.84)	41.95	(9.83)	1.36	(1, 36)	not significant
Fear	35.75	(6.39)	29.9	(15.23)	2.47	(1, 36)	not significant
Sadness	48	(6.5)	40.8	(9.6)	7.89	(1, 36)	$p < .05$
Shame	34.56	(9.61)	29.65	(13.43)	1.96	(1, 36)	not significant

H Handout Materials

Demographic Questioniare

Autonomic Perception Questionnaire (APQ): Afraid

Autonomic Perception Questionnaire (APQ): Sad

Autonomic Perception Questionnaire (APQ): Angry

STAI

Beck Anxiety Inventory

Cognitive Somatic Anxiety Questionnaire (including CSAQ-S)

Consent Form: Copy for Experimenter

Consent Form: Copy For Subject

Differential Emotions Scale (DES)