‘Emotionalism following stroke: Issues of assessment and correlations with depression and anxiety’

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Emotionalism following stroke: Issues of assessment and correlations with depression and anxiety

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Abstract

Emotionalism is a distressing condition in which voluntary control over emotional expression is lost or reduced. It occurs in 10-20% of patients following stroke and is therefore a significant problem in stroke services. The disorder commonly co-occurs with depression and there is a proposed aetiological relationship between the two conditions. There has been relatively little research on the association between these conditions to date and such investigation is complicated by difficulties in the definition and measurement of emotionalism.

The primary aim of the present study was to investigate both the differentiation of emotionalism and depression and the relationship between them. Additional aims were to examine a potential relationship between emotionalism and anxiety and provide information on the psychometric properties of the emotionalism measures used.

A cross-sectional questionnaire design was used to assess emotionalism, depression and anxiety in an opportunity sample of 60 participants, in stroke-care services. Analyses were conducted to assess the emotionalism measures and examine the associations between the study variables.

The results suggest that the measures of emotionalism and depression did not confound the conditions and were measuring separate constructs. Both depression and anxiety were found to be positively correlated with emotionalism. It was also demonstrated that emotionalism occurred alone and in combination with depression in this sample.

The findings support the opinion that psychological variables are important to an understanding of emotionalism, both in relation to its aetiology and for the development of psychological interventions. Clinical implications of the findings and directions for further research are therefore discussed.
Introduction
2.0 Introduction

2.1 Overview of the problem of emotionalism in stroke

“Mild emotionalism is manifest by brief episodes in which the patient ‘wells up’ and appears close to tears. The facial expression turns to sorrow, there is a faltering of the voice, the lips tremble and tears come to the eyes. Severe emotionalism is characterized by dramatic and rapidly evolving changes in facial expression, breathing and posture. The expression is one of anguish in which the eyes are tightly closed and the mouth is contorted. Vigorous sobbing shakes the whole body and the patient wails or repeats stereotyped phrases. Some episodes are short-lived and end abruptly within thirty seconds while others are prolonged and wax and wane over ten to fifteen minutes. Very rarely patients present with violent paroxysms of crying or laughing which continue for many hours.”

(Allman, 1991, p. 380)

As can be seen from this extract, ‘emotionalism’ or ‘pathological laughing and crying’ is a distressing condition in which normal, voluntary control over emotional expression is lost or reduced. Crying, or more rarely laughing, can happen involuntarily and suddenly, in situations where the sufferer would not wish to express emotion and where such expression may be embarrassing and distressing. Emotionalism can arise in a number of neurological conditions and has been reported to occur in approximately 10-20% of patients following stroke. It is therefore a significant problem in stroke services (House, Dennis, Molyneux, Warlow & Hawton, 1989). Episodes of involuntary emotionalism can be distressing for patients and their families, can interfere with rehabilitation programmes and can be socially disabling in the longer term, hindering patients' resumption of social and occupational roles and leading to social isolation in some cases (Allman, 1992). It is therefore important for care staff to be aware of
emotionalism as a potential problem in stroke and for there to be a reliable method of assessing the condition, both in the clinical setting and in research into its aetiology and treatment.

However, the assessment of post-stroke emotionalism can present difficulties in clinical practice. For example, the condition is often not reported by patients due to embarrassment, or their fear of provoking an episode of crying by discussing the problem. It can therefore be a hidden problem and can go unrecognised by staff. Episodes of emotionalism can also be misinterpreted by carers as an understandable reaction to frustration and disability following stroke, rather than as a post-stroke complication that may require treatment (Brown, Sloan & Pentland, 1998).

Another major issue in the assessment of emotionalism is that it can also be misconstrued in the clinical setting as a feature of depression and the two conditions need to be differentiated. However, this issue is complicated by findings that stroke patients with emotionalism also have elevated scores on measures of depression and that the two conditions often co-occur (Robinson, Parikh, Lipsey, Starkstein & Price, 1993).

These findings have led to the theory of a potential aetiological link between emotionalism and depression (Andersen, Vestergaard, & Ingeman-Nielsen, 1995). In the research literature, emotionalism was traditionally considered to be unrelated to depression and therefore described as a ‘psychologically meaningless accompaniment to brain injury’ (Calvert, Knapp & House, 1998, p. 929). However, more recent research has found that it can be effectively treated with antidepressant medication (see for example: Schiffer, Herndon, & Rudick, 1985; Andersen, Vestergaard & Riis, 1993).
This has led to the theory that emotionalism in stroke may be related to lesion damage to serotonergic pathways in the brain. Further, as serotonergic neurotransmission is also disturbed in depression, it is proposed that emotionalism and depression may share a common aetiology and this is suggested as an explanation for the frequency of their co-occurrence (Andersen, Vestergaard, & Ingeman-Nielsen, 1995).

The implication of this theory for the assessment of emotionalism is twofold. On the one hand, the overlap of emotionalism and depression in presentation can complicate the assessment of both conditions and they need to be differentiated in both research and clinical practice. Conversely, the relationship between the two conditions may be important in terms of the aetiology and treatment of them both. Therefore, there is also the need to examine the relationship between them.

A final aspect to the relationship between emotionalism and depression is that although they often co-occur, they do not do so in all cases (Robinson, 1998). That is, it appears from indirect findings in antidepressant treatment trials that stroke patients can present with emotionalism alone or with a co-occurrence of the two conditions. However, this has not been systematically investigated and it is not clear whether these different presentations are different types of the condition, with different aetiologies, or different presentations of one syndrome (Andersen, 1995).

There are several clinical implications of the proposed relationship between emotionalism and depression in stroke. Where emotionalism and depression co-occur, further information on their association may be useful in the application or adaptation of psychological treatments of depression for stroke patients. Additionally, it is important
to determine whether some patients may present with a more 'neurological' type of disorder (without co-occurring depression), that requires specific management and for which specific treatments could be developed. Finally, there is also the question of whether the co-morbidity of depression and emotionalism affects their response to antidepressants and again, further information on how the two conditions combine would be useful in treatment studies.

In summary, there are reported difficulties in the identification of emotionalism and a major aspect of this is the relationship of the condition to depression. It is important to identify each condition as accurately as possible to assist treatment decisions and for monitoring of patients’ progress, as well as to clarify their measurement in research studies. As there has been relatively little research into the psychological correlates of emotionalism, it is an area that is recognised as being in need of further investigation (House, Dennis, Molyneux, Warlow & Hawton, 1989). Such investigation is important to provide further understanding of the aetiology of the condition, as well as for the development of psychological models that may contribute to the development of psychological interventions. There is therefore an important role for clinical psychology to conduct research into the identification and measurement of emotionalism in stroke, investigate aspects of its relationship with depression and feed the results of this research into clinical practice.

This study therefore investigated the relationship between emotionalism and depression, taking into account difficulties in the differentiation of the two conditions in both clinical practice and research. Additional aims of the study were to assess the
relationship between emotionalism and anxiety and to assess the effect of different assessment methods for each condition.

A more detailed review of the research literature on emotionalism is given below, with a summary of the major research themes, theories and questions about the condition.

2.2 Literature review of research and theories of emotionalism

Classical descriptions and neuro-behavioural theories of emotionalism

An increased tendency to cry in association with certain brain diseases has been recognised by clinicians since the late nineteenth century (Allman, 1991). This phenomenon is currently most commonly referred to as ‘emotionalism’ and studies have found that it can occur in variety of conditions, for example in approximately 10% of people with and amyotrophic lateral sclerosis and 7-10% of people with multiple sclerosis. Other causes of the condition include cerebral tumours, aneurysms and chemical exposure (Shaibani, Sabbagh & Doody, 1994).

The condition has been classically described as a disturbance of the motor concomitants of emotional expression (Wilson, 1924). Its defining characteristics have been suggested to be: sudden outbursts of crying (and/or more rarely, laughing), with a lack of voluntary control, occurring in response to inconsequential stimuli, and without a corresponding change in affect (Poeck, 1985). Thus the condition has been traditionally defined, not as a change in emotional states, but as a disturbance to the motor components of emotional behaviours (Van Gijn, 1993). As such, it has been thought to be a neurological condition, unrelated to psychological variables (Calvert et al. 1998).
Emotionalism in stroke has been hypothesised in the neurological literature to be related to lesions involving voluntary neural pathways (Signer, 1988) and is described as a 'limbic-motor disconnection syndrome' (Deoliveirasouza, Defigueiredo & Andreiulo, 1995). A comprehensive review of the proposed neuroanatomy underlying the disorder is described by Shaibani et al. (1994). These authors describe a theoretical, anatomical neuro-circuitry for emotional expression. It is suggested that a system for emotional control exists, that links the 7th nerve nucleus in the pons, to the 10th motor nucleus in the medulla and the phrenic nuclei in the upper cervical cord. This neuro-circuitry links to what is known about facio-respiratory co-ordination and control, as operates in emotional expressions such as crying. It is suggested that there is an integrative or control centre for emotional expression in the mesal thalamus, hypothalamus and sub thalamus. Activity of this integrative centre is hypothesised to be controlled by both voluntary corticobulbal fibers and by involuntary fibers from the orbital surface of the frontal lobes, through the bulbar nuclei. Therefore, bilateral voluntary neural pathways normally inhibit bilateral involuntary pathways for emotional display. Thus, bilateral destruction of the corticobulbal (voluntary) tracts is suggested to be the most common cause of emotionalism (Robinson, 1998).

In support of this theory, early case reports observed that emotionalism appeared to be related to brain injury that is more severe and diffuse (Poeck, 1985), as bilateral destruction is usually associated with diffuse brain damage. This fitted with findings from neuro-imaging, as subsequent lesion location studies confirmed that emotionalism is associated with large lesions (Hanger, 1993). However, there are also reports in the literature of emotionalism being related to smaller focal lesions in the brainstem, to
unilateral lesions and to lesions in various other sites (Tatemichi, 1987). For example, two patients were found to have emotionalism with right frontal lesions (Ross & Stewart, 1987). These findings contradict the hypothesis of the condition being due to extensive and bilateral neurological damage and theories on its relationship to lesion location remain inconclusive (Robinson, 1998). It is therefore commented that emotionalism is a complex phenomenon, the aetiology of which is likely to involve a complex interplay of organic and psychological factors (Signer, 1988). On from this, another strand of research fed into the debate about its causation.

_Antidepressant treatment of emotionalism and the serotonergic hypothesis_

Concurrent with neuro-behavioural descriptions of emotionalism as above, evidence began to be published about its response to treatment with antidepressants. This research developed initially from reports that patients treated with antidepressants for mood disorder also showed improvement in emotionalism (for example: Wolf, Santana & Thorpy, 1979). Trials of this medication specifically for emotionalism were therefore undertaken, firstly with tricyclic antidepressants, then using selective serotonin re-uptake inhibitors (SSRIs) due to their more acceptable side effect profiles. The first controlled drug trial was conducted by Schiffer, et al. (1985) in twelve patients with multiple sclerosis. It was found that the response to amitriptyline was significantly better than to placebo. Emotionalism also improved rapidly with this treatment, in one to three days. This finding was replicated with stroke patients in a trial of nortriptyline by Robinson et al. (1993) and by Andersen et al. (1993) in a crossover trial of citalopram versus placebo. In these studies, it was again found that emotionalism improved rapidly with these medications and all patients' emotionalism symptoms
recurred when the drug was discontinued, confirming the effect of the treatment. In addition to these controlled trials, nine further published reports have been identified that have found antidepressant treatment effective.

As SSRIs were found to be an effective treatment for emotionalism, it was suggested that serotonergic neurones may be involved in the aetiology of emotionalism and the ‘serotonergic hypothesis’ was subsequently proposed (Andersen et al. 1995). This hypothesis suggests that emotionalism may be due to stroke-induced partial destruction of the serotonergic raphe nuclei in the brainstem, or their ascending projections to the hemispheres. Therefore, rather than only diffuse or bilateral lesions being necessary to cause emotionalism, it was hypothesised that lesions at any point along the serotonergic pathways could cause the condition. This theory was felt to be a better account of the findings of emotionalism being related to smaller, more focal lesions as well as to bilateral stroke damage.

Evidence in support of this theory is accruing and is converging with neuro-behavioural hypotheses, as lesion locations in post-stroke emotionalism research are increasingly being categorised in relation to the serotonergic pathways in the brain. For example, a study by Andersen, Ingeman-Nielsen, Vestergaard & Riis, (1994) found a clear association between emotionalism and lesions along various sites of the serotonergic pathways from the raphe nuclei in the brain stem, ascending to the limbic forebrain through the basal ganglia. This was a relatively small study of twelve patients and although well designed and with clear findings, it has not been replicated as yet, with most other supporting evidence coming from case studies. However, many authors do
now agree with the proposed involvement of the serotonergic system in the aetiology of emotionalism (see for example: Kim, 2002; Kaschka, Meyer, Schier & Froscher, 2001).

As neuro-behavioural theories do not appear to provide a complete account of the aetiology of emotionalism, other studies have moved from emphasizing the location of lesion as the main variable, to examine the relationship with depression and other psychological correlates. This is important, as psychological models of the disorder may add to the understanding of the effects of emotionalism on sufferers and contribute to the development of psychological interventions to provide alternatives or adjuncts to antidepressant treatment.

The relationship between emotionalism, depression and other psychological correlates

In this area of research, House et al. (1989) conducted a study with 128 stroke patients interviewed at one, six and twelve months post-stroke, using the Present State Examination (PSE: Wing, Cooper & Sartorius, 1974) and the Beck Depression Inventory (BDI: Beck, Ward, Mendelson, Mock & Erbaugh, 1961). The sample was divided into two groups of patients with and without emotionalism. The proportion of patients defined as having the condition was 15% at one month, 21% at six months and 11% at twelve months. Mean scores on total symptoms from the two measures were higher overall in patients with emotionalism, at all time points. However, these differences in scores only reached significance on the PSE at one and six months and at six months on the BDI. There was therefore an association between emotionalism and mood score, but only at six months post-stroke. It was also found that most participants interviewed could describe an emotionally relevant precipitant to their crying episodes.
The authors therefore concluded that, ‘crying and laughing can occur without emotionally meaningful stimuli, but this is rare’ (House et al. 1989, p. 993).

Subsequent to this finding, a study by Andersen (1995) examined the relationship between emotionalism and depression further. Here, the frequency of emotionalism was compared to mood score and post-stroke depression, measured using the Hamilton Rating Scale for Depression (HRSD: Hamilton, 1967). It was found that HRSD scores were significantly greater in patients with emotionalism than those without. There was also a highly significant association between the one-year incidence of emotionalism and post-stroke depression. It was therefore concluded that although emotionalism and depression are two different conditions, ‘the reason for (this) overlap might be that dysfunction of serotonergic neurotransmission is common to both conditions’ (Andersen, 1995, p. 49). The serotonergic hypothesis was thus proposed at this point. This theory was also later expanded, with the suggestion that emotionalism may be due to pre-synaptic depletion of serotonin, hence its rapid response to SSRI treatment in 1-3 days, whereas depression has slower treatment response in approximately three weeks, concurrent with postsynaptic receptor changes (Andersen, 1997).

A further study by Calvert et al. (1998) commented that the causes of emotionalism remain poorly understood, as there has been no definitive link discovered between emotionalism and lesion location. They also questioned the idea that emotionalism occurs in response to ‘inconsequential’ stimuli, as suggested by Poeck (1985) and were interested in developing a psychological model of the disorder. They therefore examined its psychological associations using the PSE and General Health Questionnaire (GHQ: Goldberg, 1992), in a sample of 448 stroke patients who were
involved in a wider stroke outcome study. Patients with emotionalism scored significantly higher than those without the condition on the GHQ. On the PSE, there was also a higher incidence of irritability and ideas of reference in the emotionalism group, over and above the effect of depression. The authors therefore suggested a link between post-traumatic stress disorder (PTSD) and emotionalism, as irritability is common in PTSD and both conditions involve 'recurring, uncontrollable, emotionally charged mental events' (ibid, 1998, p. 929). There was also found to be a higher incidence of depression in the emotionalism group in this study, but most with the condition were not depressed. Additionally, it was again found that the majority of people with emotionalism could identify a provoking stimulus to their episodes, such as thinking about sentimental things and having sad thoughts. This was taken by the authors as evidence against the theory that emotional episodes occur without contextual or meaningful stimuli. This finding replicated the results in House et al. (1989) and Allman et al. (1992) where it was also found to be rare for participants to report crying in response to non emotionally-relevant or inconsequential stimuli.

Eccles, House and Knapp (1999) then conducted a study into a possible relationship between emotionalism and coping styles. Here, it was suggested that because emotionalism is described as uncontrollable, those with the condition might feel more passive, helpless or avoidant in their response to stroke. The study therefore predicted that stroke sufferers with emotionalism would have a more external locus of control than those without. The measures used were the GHQ, the Impact of Events Scale (Horowitz, Wilner & Alvarez, 1979) and the Recovery Locus of Control Scale (Partridge & Johnston, 1989), with 65 participants. 29% of this sample were assessed as having emotionalism and these participants again had more mood symptoms as
measured on the GHQ. After controlling for GHQ scores, an association was found between emotionalism and items from the other two scales addressing helplessness, avoidance, more intrusive thoughts about stroke and more anxious preoccupation. The conclusions of this study were that emotionalism may not be related to PTSD directly, but may be related to an abnormality in processing of emotionally important stimuli, perpetuated by an avoidant coping style as a maintaining factor.

Finally in this area of research, anxiety has rarely been investigated as a correlate to emotionalism. One published study by Feinstein, Feinstein, Gray & O’Connor (1997) did assess depression and anxiety in patients with emotionalism, using the Hospital Depression and Anxiety Scale (HADS: Snaith & Zigmond, 1994). Two case control groups of 11 and 13 patients, with and without emotionalism respectively, were assessed on the HADS and no differences were found in scores for depression or anxiety in the two groups. However, this was in an out-patient group of participants with multiple sclerosis rather than stroke.

*The relationship between emotionalism and depression*

From the review of the research above, it can be seen that emotionalism has been classically defined as a neurological condition, for which neuro-behavioural hypotheses have been advanced and the relationship to lesion location has been particularly scrutinised. As such, the condition was considered to be unrelated to psychological correlates. However, the more recent serotonergic hypothesis suggests that emotionalism and depression may both be related to serotonergic neurotransmission. There are also findings in the majority of studies that patients with emotionalism score
higher on measures of mood disorder and have a higher incidence of depression (e.g. Andersen et al. 1993; Robinson et al. 1993). Additionally there is the finding in descriptive studies that episodes of emotionalism in stroke are usually triggered by emotionally relevant stimuli (House et al. 1989; Allman et al. 1992). Taken together, this has led to a reconsideration of the classical definition of emotionalism as purely a disorder of the ‘motor’ expression of emotions (Andersen, 1995) and raises questions about its relationship to psychological factors such as depression, anxiety and coping styles.

The relationship with depression seems particularly important as the co-occurrence of the two conditions may influence their treatment with both medication and psychological interventions. To date, there has been relatively little research on how emotionalism and depression combine, with the studies by House et al. (1989) and Andersen et al. (1995) being the most comprehensive so far. In these studies, an association with depression has been found using non-parametric statistical analyses and further information on this association would be useful.

Antidepressant treatment trials also find that depressive symptoms are more common in participants with emotionalism (see for example: Brown et al. 1998; Burns, Russell, Stratton-Powell, Tyrell, O’Neill & Baldwin, 1999; Muller, Murai, Bauer-Wittmund & von Cramon, 1999). These studies raise questions about whether the treatment effect seen is due to an independent, direct effect on emotionalism, or to treatment of depression. Published opinion on this appears divided. Andersen et al. (1993) demonstrated that scores on the HRSD were significantly higher in the groups of patients with emotionalism, with these scores then falling with antidepressant treatment.
A later review by Andersen (1997) suggests that the improvement of emotionalism with antidepressant treatment 'may be in part attributable to a concomitant decrease in depressive symptoms or a stabilising effect on mood' (p.661). However, in the study by Robinson et al. (1993), although more than half of participants with emotionalism also met the criteria for depressive disorder, the improvement of emotionalism was concluded to be independent of the improvement in depression. It was therefore considered in the present study, that the interpretation of these results may be complicated by emotionalism and depression being confounded in measurement. This possibility has not been examined so far in the literature. This last point leads on to the final theme in the literature, of the methodological difficulties encountered in the measurement of both emotionalism and depression.

**Methodological problems in the measurement of emotionalism**

In the emotionalism literature to date, there remains a lack of consensus as to the precise definition and defining features of the condition (Moore, Gresham, Bromberg, Kasarkis & Smith, 1997). This problem is reflected in that it is variously named in the literature, being referred to as for example, emotional incontinence, emotional lability, pseudobulbar syndrome and pathological laughing and crying. These different terms are used in the research literature either synonymously, or to refer to what are thought to be different conditions (Allman, 1991) and this bears a clear relationship to the difficulty that exists in conceptually defining the condition.

Emotionalism also varies considerably in its presentation, from a mild disturbance of emotional expression (often called emotional lability), to prolonged periods of crying.
and/or laughing, involving a fixed pattern of facial spasms that are uncontrollable by the sufferer. There is yet no consensus whether these different presentations are the same or different conditions (Andersen, 1993). Some authors suggest that different presentations may be distinct sub-types of the disorder, (for example: Lezak, 1983). Others propose that the disorder should be viewed as a single syndrome with different degrees of severity, with the more severe presentations corresponding more closely to Poeck’s (1985) criteria described above. This suggests, ‘a syndrome of emotionalism of which pathological crying may be an extreme form and the milder presentations more controllable or which break through in emotionally charged situations’ (Andersen, 1994, p. 1050). Thus the debate continues as to whether it may be more useful to consider emotionalism as having a dimensional or categorical pattern (McGrath, 2000) and whether its different presentations represent different types of the disorder that may have different aetiologies (Andersen, 1995).

In stroke studies, the distinction and separation of the different presentations of emotionalism often is not, or cannot, be made. In a detailed study of 30 people with emotionalism by Allman et al. (1992), it was found that none of the patients studied fulfilled all Poeck’s (1985) criteria. The authors here argue against there being separate subtypes of emotionalism and state that it was, ‘difficult to fit patients into categories’ as suggested by Poeck’s criteria and that in their participants, ‘the components of crying combine in a complex and varied way’ (Allman, 1991, p.381). As well as creating difficulty in clinical diagnosis of the disorder, this nosological confusion also leads to methodological problems in the research literature. Emotionalism is not necessarily defined in the same way across studies and not usually rated using a standardised and validated measure. Also, measures often do not include an assessment of the severity of
the condition. Different measures used to assess emotionalism may therefore be assessing different criteria and identifying different forms of the disorder.

It therefore remains to be established whether the differing presentations of emotionalism are in fact, different forms of the condition and if they may then have different aetiologies (Robinson et al. 1993), or different relationships to depression. Evidence from published studies suggests that emotionalism occurs alone, or in combination with depression, although this has not been clearly demonstrated. It has not yet been verified whether these presentations represent different types of the disorder that could be separated into groups and defined by their different relationships to proposed aetiological or related variables.

*The measurement of depression in stroke*

A final and important aspect of the present study is the complex problem of making a diagnosis of depression in medical populations. The measurement of depression in stroke usually relies on psychiatric classification systems such as the ICD-10 Classification of Mental and Behavioural Disorders (ICD-10: World Health Organisation, 1992) or assessment tools such as the HDRS. These measures were developed for use with psychiatric populations and are therefore not specifically standardised for use in stroke (Allman, 1991). This can lead to several problems.

Firstly, the clinical picture of depression in stroke may be altered in the presence of physical illness or cognitive impairment (Woods, 1999). For example, in stroke patients with aphasia, the only signs of depression may be weight loss, sleep disturbance and
irritability. Conversely, these signs may also occur in stroke patients in the absence of depression, as a consequence of illness or hospitalisation (Black, 1995). Commonly used depression measures such as the HRSD have many somatic items, as do the criteria for depression from the ICD-10, which can artificially inflate the ratings of symptoms (Andersen, 1997). Conversely, stroke patients may commonly have individual depressive symptoms, but not reach the overall ICD-10 criteria for a diagnosis of major depression to be made. The ICD-10 criteria also state that depressive symptoms need to be present for at least two weeks, more of the time than not, in order for a diagnosis to be made. Since most patients will have poor recall for the immediate post-stroke period, this can be difficult to assess (Robinson & Starkstein, 1989).

Secondly, there can be problems in gaining accurate information about patients’ mood state from usual assessment methods. Stroke patients may have difficulty in completing self-report measures of mood, due to praxic or visual problems. However, observational methods of assessment such as a psychiatric interview may also be problematic, as patients with for example, right hemisphere or bilateral brain damage can appear depressed due to having a blank facial expression or aprosodia (Ramasubbu & Kennedy, 1994).

Thirdly and more generally in depression assessment, there is a debate about what underlying constructs different measures may be addressing. Clark and Watson (1991) have suggested that many depression scales may be measuring ‘general negative affect’ rather than distinguishing ‘core’ depression and differentiating this from anxiety. They suggest that the presence of low positive affect or anhedonia may be a better measure of depression than the presence of general distress or ‘negative affect’ (Watson, Clark &
Tellegen, 1988). Since the concept of anhedonia also taps the more affective and cognitive aspects of depression than somatic symptoms, a measure based on this construct may perform better in assessing core depression symptoms and reducing the potential bias from somatic items in medical populations.

The diagnosis of post-stroke depression is therefore complicated and it was considered in the present study that this might affect the examination of the relationship between emotionalism and depression. Careful consideration was therefore given to the choice of measures for the study and the process of this decision is discussed further below.

*General problems in research in stroke populations*

Finally, there are also practical difficulties in the area of stroke research that influence the design of studies. There is a complex interaction of variables during recovery from stroke, with patients being subject to many influences from their illness, hospitalisation, neurological recovery and rehabilitation interventions (Andersen, 1997). This can make it difficult to tease apart the effects of specific variables. In addition, patients may also be very physically ill in the immediate post-stroke period or busy with rehabilitation programmes. Therefore, a limited number may be able to consent to take part in research (Robinson et al. 1993). Others may be excluded because of aphasia or physical frailty, which can further reduce sample sizes and potentially lead to biases in sampling (Allman, 1991). The cumulative effect is to produce difficulties in ensuring sufficient numbers of participants are recruited to examine the complex variables proposed to be involved in emotionalism. Analysis in the majority of studies of the condition has tended to employ non-parametric statistical methods, which may limit the potential
exploration of the data. Due to the complex variables potentially involved, it may be preferable to use multivariate, parametric tests if possible, transforming the data as necessary if it does not meet the requisite assumptions. This would give more flexibility and greater power to the analyses.

2.3 The role of clinical psychology in emotionalism

In stroke, the prevalence of emotionalism was established in a large community sample as 15% at one month post-stroke, 21% at six months and 11% at twelve months (House et al. 1989). The condition usually develops in the first month after stroke and its frequency and intensity tend to diminish over the first year, concurrent with neurological recovery (Allman, 1991). However, emotionalism is known to persist in a smaller number of patients, although detailed longitudinal studies on its time-course have not yet been published. As the average health district area of 250 000 people has an estimated incidence of 600 first strokes per year, there could be approximately 120 people suffering with the condition per year in any given area (Brown et al. 1998). Emotionalism is therefore a significant problem in stroke services and a source of additional distress for sufferers and their families. The condition is therefore an appropriate target for intervention for clinical psychology in stroke and there are several ways in which the skills of a Psychologist may be useful regarding the problems it presents.

Firstly, it is crucial to identify emotionalism in patients accurately and early, so that specific and appropriate intervention can be made to alleviate distress and minimise secondary problems. As patients often do not seek advice about it, it is not uncommon for staff to be unaware of the problem during in-patient care. There is therefore a role
for clinical psychology to conduct research into the identification of the condition, and to raise the awareness of care-staff to its effects through discussion, education and dissemination of literature.

There is also a valuable role for psychologists in liaison with other staff to develop supportive interventions for emotionalism during in-patient care. Initiatives could be devised to give information about the condition to patients and carers, to increase their awareness of its immediate and longer-term effects during rehabilitation programmes and recovery. As emotionalism has been found to be associated with depression in some cases, psychological treatment of depression may be appropriate for those patients in whom the conditions co-occur. Where it is found to occur alone, it may be possible to develop more specific treatments.

Therefore, emotionalism is an area that is appropriate for intervention from clinical psychology in stroke, as part of the profession’s role in the identification of problems amenable to psychological intervention, development of treatments, research and consultation to other staff groups.

2.4 Summary of questions from the literature and aims of the study

There was a rapid expansion in research into emotional and psychological disorders following stroke towards the end of the twentieth century (Allman, 1991). Emotionalism has been investigated as a post-stroke complication within this paradigm in more recent years. Research into the condition has progressed from its early descriptions, to neuro-anatomical hypotheses, to studies into its treatment with antidepressant medication and on to examination of its psychological correlates. Thus
the definition of emotionalism has developed from it being considered as solely a disorder of the voluntary, motor control of emotional expression, to the theory that it appears to be intrinsically related to depression and possibly other psychological correlates, at least in some cases. This study was conducted to provide further information on the relationship between emotionalism and the psychological variables of depression and anxiety. A supplementary aim of the study was to consider the methodological problems in the assessment of both emotionalism and depression and determine whether these may affect the examination of the relationship between them.

Primary aim of the study: The relationship between emotionalism and depression

As discussed above, the accurate assessment of emotionalism is an important issue for patient care in stroke services. The relationship between emotionalism and depression is a significant aspect of this issue, as it has implications for both the identification of emotionalism in practice and in research into its aetiology and treatment. The primary aim of the present study was therefore to build on previous research and provide further information on the relationship between emotionalism and depression. This involved consideration of methodological issues in the measurement of both these conditions in stroke:

The first methodological issue is the conceptual separation of emotionalism and depression in measurement. It is recognised that the different presentations of emotionalism and lack of agreed criteria for its definition pose difficulties in its accurate identification in both clinical practice and research. Related to this is the possibility that emotionalism can be misconstrued in the clinical setting as a feature of depression and
the two conditions need to be differentiated so that appropriate treatment can be considered. Methods of assessment therefore need to distinguish the two conditions. In research, the potential confound between emotionalism and depression could also potentially lead to problems in interpretation of data. For example, in antidepressant treatment trials as described above, the query arises as to whether the treatment effect on emotionalism is due to an independent, direct effect on the condition, or to the concurrent treatment of depression. This issue can be difficult to clarify where the two conditions co-occur. The first part of the study therefore concerned the question of whether depression and emotionalism are conceptually separated using existing methods of measurement. It was therefore planned to conduct a factor analysis to determine whether measures can produce separate factors corresponding to the two conditions.

The second part of the primary study aim was to extend previous research findings on the relationship between emotionalism and depression. The most comprehensive study into the relationship between emotionalism and depression so far published is by Andersen (1995). As described above, this study analysed the between-groups relationship between emotionalism and mood score. It was therefore planned to go on to examine the strength and direction of the association between emotionalism and depression, using measures of severity of both conditions in a correlational analysis. As serotonergic neurotransmission has been hypothesised to be disrupted in both conditions, it was predicted that the two conditions would be positively correlated. That is, it was predicted that emotionalism scores would increase in severity along with depression scores. Emotionalism has also been found to be related to other variables in some studies, such as time since stroke (emotionalism resolves over time: Allman,
1991), gender (emotionalism was found to be more common in females: McGrath, 2000) and lesion location (emotionalism is more frequently associated with bilateral stroke lesions: Robinson, 1998). This relates to the question of whether such non-psychological variables may be more important in explanatory models of emotionalism than psychological correlates. It was therefore planned to control for other associated variables in this analysis. A second prediction was therefore that depression scores would account for variance in emotionalism scores, after controlling for the contribution of other non-psychological variables. This would then address the question of whether emotionalism may be considered a 'psychologically empty' phenomenon, or whether psychological correlates may be important in an understanding of its aetiology.

Secondary aim of the study: The relationship between emotionalism and anxiety

As there has been no previous research into a potential association between emotionalism and anxiety in stroke, the secondary aim of the study was to conduct a preliminary measurement of the relationship between these two variables. The study described above by Eccles et al. (1999) found an association between emotionalism and a scale measuring anxious preoccupation. Additionally, involuntary emotional expressions are reported by patients to be distressing and embarrassing in social situations. It was therefore predicted in the present study that emotionalism would be related to anxiety and that measurements of the two conditions would therefore be positively correlated.
A supplementary aim of the study was to address questions that are raised in the literature, regarding whether the use of different methods of assessing emotionalism and depression may affect the examination of their association. The review of the literature indicates that there are differences in how emotionalism is conceptualised by separate researchers. This leads to differing terminology and methods of assessment for emotionalism being used in different studies (Muller, Murai, Bauer-Wittmund & von Cramon, 1999). Added to this, it is not always made clear in published research what definition or criteria for emotionalism are being used. For example, many studies use semi-structured interviews in diagnosis, but these are not always described or published. There is therefore the possibility that different research results may be obtained from different measures of emotionalism.

Different measures or criteria have also been used in emotionalism studies to assess depression. It was considered that this might have an additional effect on findings into the association between the two conditions. For example, the differences between methods of assessing depression potentially lead to widely differing rates of reported depression between studies (Robinson, 1997). Added to this, there are also recognised difficulties in the diagnosis of depression in medical populations such as somatic bias, which may also affect findings. The use of differing measures of both conditions between studies also potentially interferes with the combination of results in meta-analyses, which would be valuable in an area such as this, where sample sizes can be limited. Therefore, the final aspect of the study concerned the choice of measures for both emotionalism and depression. Specifically, the question addressed was whether
different results on rates and associations of emotionalism and depression would be obtained from different measures of both conditions.

Two measures of each condition were therefore chosen, to give information on this question from comparison of their results. Measures of depression were chosen to allow comparison with previous research and to address the potential effect on results from somatic bias. Specific scales for emotionalism are being developed and validated, but this process is at a relatively early stage and there is little psychometric information on measures available at the moment, particularly measures specific to stroke populations. Two measures of emotionalism that have been most commonly used in previous research were therefore chosen, to provide further information on their psychometric properties and allow comparison between their findings. The measures in the study are discussed further below.

Finally, it was planned to explore rates of co-occurrence of emotionalism and depression in the study, to determine the proportion of participants presenting with co-morbid emotionalism and depression and emotionalism alone.
2.5 Hypotheses

Hypothesis 1: Conceptual separation of emotionalism and depression

Factor analysis of participants' scores from emotionalism and depression measures will extract two factors, corresponding to the two conditions.

Hypothesis 2: Correlation between emotionalism and depression scores

2a: Participants' scores for emotionalism and depression will be significantly positively correlated.

2b: Depression scores will account for variance in emotionalism scores, after controlling for associations with non-psychological variables.

Hypothesis 3: Correlation between emotionalism and anxiety scores

Participants' scores for emotionalism and anxiety will be significantly positively correlated.

Hypothesis 4: Effect of different methods of assessment of emotionalism and depression

4a: Different rates of emotionalism will be obtained from different measures of this condition.

4b: Different rates of depression will be obtained from different measures of this condition.

4c: Different measures used to assess emotionalism and depression will affect the statistical associations between the conditions.
Method
3.0 Method

The primary aim of the study was to examine the relationship between emotionalism and depression, using existing measures that have the best available psychometric properties to assess the severity of both conditions in stroke patients. A preliminary examination of the correlation between emotionalism and anxiety scores was also planned as a secondary aim. A supplementary aim of the study was to examine whether the association between emotionalism and depression may be affected by the use of different measures of the conditions. Finally, a descriptive analysis was planned to examine the patterns of co-occurrence of emotionalism and depression in the sample. The best method was considered to ensure that sufficient numbers of participants with emotionalism and depressive symptoms were recruited to achieve these aims.

3.1 Design

The design of the study was planned in consultation with a medical statistician. It was decided that a cross-sectional questionnaire design would be the most appropriate approach to meet the study aims. This meant that participants would be recruited at varying time-points post-stroke. As emotionalism has been found to resolve over time, it was therefore planned to record the time since stroke as a study variable and control for this in the analysis. It was also discussed that regression and correlational analyses would require participants with a range of scores on the relevant variables, in order to explore the relationship between these in the study. As the prevalence of emotionalism is known to be relatively low (House et al. 1989), sufficient numbers of people with emotionalism also needed to be recruited. It was therefore initially considered that selective over-sampling of people identified as having emotionalism may have to be
employed if sufficient numbers of people with emotionalism were not seen. This could have been done by inviting referrals of patients with emotionalism from the Consultant Physicians supporting the study. However, sufficient numbers of people with emotionalism were recruited during the term of the study, without this being necessary.

Recruitment sources for the study were planned in discussion with stroke services staff in the area, including the three Consultant Physicians supporting the study, ward and out-patient department managers and the Specialist Nurse for stroke services co-ordination. The study was time-limited and there were additional limits on researcher-time available each week for data collection, due to an unavoidable change in clinical placement. It was therefore considered that recruitment from only one ward would have restricted the potential number of participants and recruitment from a range of clinical settings would be the most appropriate method to maximise sample size. It was therefore decided to use both in-patients and out-patients at several hospital sites as sources of recruitment. This method followed that used in previous emotionalism research (for example: Allman et al. 1992; Andersen et al. 1995).

Two local stroke populations that had active stroke registers were considered first for the study, as consecutive admissions following stroke were recorded in these areas and could have been used to structure recruitment. However, there were several other research studies already in place in these populations and initial discussion with researchers in the areas suggested that it would not be possible to approve a further study to take place. Additionally, it was thought that the limits to researcher time would mean that many patients recorded on the register may be discharged on days when the researcher was unavailable, thus making it difficult to use the strategy of consecutive
admissions for recruitment. Therefore an area was chosen that did not have an extensive programme of research already in place. As this clinical area did not have an active stroke register, the ‘care pathways’ of stroke patients was mapped in consultation with the area Nurse Specialist Stroke Co-ordinator, to consider potential sources of recruitment.

The pathways of care for stroke patients in this clinical area is shown diagrammatically in Figure 1 below, with the sources of recruitment used for the study underlined.

Figure 1: Clinical settings used as sources of participant recruitment (shown underlined), within the stroke care system of the Healthcare Trusts used in the study. One out-patient department (shown in italics marked*) was not available to be used for recruitment.
Within the area of the study, people suffering stroke were either admitted to an acute ward at one of two Hospital Trusts, or referred by their General Practitioner to one of two medical out-patient departments. If admitted, patients were then either discharged home within a few days from the acute ward, or transferred to the respective stroke rehabilitation ward on the same site. After a period of care on the rehabilitation wards, patients were either discharged home with subsequent attendance at out-patients for follow-up, admitted to long-term care settings, transferred for further rehabilitation at a local community hospital, or discharged home with attendance at a local rehabilitation centre on one day per week. In consultation with the Ward Managers in the area, recruitment was not attempted from the acute stroke wards as it was felt that patients were likely to be medically ill in the initial post-stroke period and unable to participate in the study. This strategy of avoiding the immediate post-stroke period for recruitment was again in line with recommendations for emotionalism research (Allman, 1991).

In order to target as many potential sources as was feasible, it was therefore planned to recruit participants from the two stroke rehabilitation wards, the longer-term rehabilitation ward at a local Community Hospital, the local Rehabilitation Centre and the out-patient departments, over the six-month term of the study. (In the event, recruitment was not possible from one of the out-patient departments, due to a lack of room availability in which to interview participants in privacy). This method therefore drew on two groups of patients: out-patients and in-patients. Data from these sources was planned to be subjected to initial analysis to ensure that they did not differ significantly on variables that may affect the reliability of findings. If sufficient reliability was found between the two samples, it was planned to collapse them into one. It was considered that the use of such an opportunity sample also had the disadvantage
of potential selectivity of participants. It was therefore planned to compare the characteristics of the sample obtained to available local information on relevant demographic and study variables in order to comment on the representativeness of the sample.

3.2 Participants

Power analysis was used to provide an apriori estimation of the number of participants needed for the study. No published studies were identified that have used correlational analyses to examine the relationship between emotionalism and depression. A power analysis to determine the effect size in such a study could therefore not be performed directly. However, the required sample size was estimated using the effect size found in a related study using a different statistical test and applying this to the formula for a correlational analysis (Clark-Carter, 1997). The study into psychological associations with emotionalism after stroke by Calvert et al. (1998), found a medium effect size of 0.3 for the mean between groups scores on the GHQ, between stroke patients with and found a without emotionalism, using a t-test. To achieve power of 0.79, at significance level 0.05, it was therefore calculated that 60 participants would be needed for a correlational analysis (Cohen, 1992). Analysis conducted after 60 participants had been recruited indicated that the effect size for the study was acceptable and data collection was therefore completed at this point.

Participants for the study were an opportunity sample of in-patients and out-patients seen in stroke-care services in the Leicestershire area. Participants were seen during their admission for in-patient stroke care, or on their attendance at either the out-patient department or rehabilitation centre, at the Leicester Royal Infirmary, Leicester General
Hospital and Coalville Community Hospital. Inclusion criteria were that patients had a computerized tomography (CT) confirmed stroke or clinical diagnosis of stroke and were aged above 18 years. Patients who had suffered more than one stroke and who had other non-neurological medical conditions were included in the study. Patients were excluded from the study if they did not give informed consent to participate, had difficulty understanding the consent form (Appendix D) or questionnaire instructions due to communication or cognitive problems, or on the advice of care staff were too medically ill to be approached.

One hundred and fifteen in-patients, 24 day-patients and 36 out-patients were considered for inclusion in the study. Of these, 17 did not wish to participate, 12 were excluded due to communication or cognitive difficulties, 21 were excluded as they were too medically ill to participate and 6 were excluded due to their participation on a drug research study set up subsequently in the area. Sixteen out-patients were sent study information but not seen as they did not attend or cancelled their appointments at clinic, or could not be seen by the researcher due to time-limits in clinic. Forty-three in-patients were given study information but discharged before they could be seen by the researcher.

3.3 Measures
The measures to be used for the assessment of both emotionalism and depression was an important aspect of the study. Therefore, consideration was given to the choice of these, taking into account the psychometric properties of potential measures, their acceptability and ease of use, and the methodological problems reported in the emotionalism literature. This study had the advantage of not being part of a larger stroke
research study, so there was no restriction on the choice of measures in order to meet other study aims. However, the abilities and medical status of participants needed to be considered. It was aimed to achieve a balance between the choice of optimal measures, with the need to avoid extensive interviews, as these were felt to be potentially too tiring for participants that were in recovery and may be medically ill. Existing measures used to assess emotionalism and depression were reviewed from the literature and consultation was sought from experts in these fields in University Psychology and Psychiatric Departments.

**Depression measures**

It is discussed in the literature that depression in stroke studies is measured by differing means, depending on the aims of the study (Gibbons, Clark & Kupfer, 1993). For example, clinical assessments may be used to define cases of depressive disorder in studies of prevalence rates, whereas measures of the severity of a depressive syndrome are often used in treatment outcome studies. Thus, either categorical or dimensional measurement may be appropriate for different study goals. Here, the aim of the study was to explore the relationship (strength and direction of association) between emotionalism and depression scores and a measure of depression severity was therefore considered the most appropriate method of assessment.

Another consideration in the choice of measures was that it has been found that self-report measures can be problematic in stroke populations, as some patients may be unable to complete these due to cognitive or communication difficulties. A study comparing the performance of different types of depression measures in stroke by
House, Dennis, Hawton and Warlow (1989) found that up to 20% of patients had such difficulty with unassisted self-report measures. These authors therefore cautioned that researchers need to be aware that self-report methods may lead to lower response rates and consequent selectivity in samples. However, it is discussed in the literature that there may also be problems in the accuracy of observational methods of depression assessment in stroke, due to patients' presentations being affected by such factors as blank facial expression, which can be a result of right-sided lesions.

It is also known that differing levels of caseness for depression may be found, depending on which assessment method is used. For example, the prevalence of post-stroke depression has been reported to vary widely across studies between the range of 25-79% (Kneebone & Dunmore, 2000). There may also be little agreement between measures used with the same population, even where these are of the same type, as has been found in comparison of findings from two diagnostic schedules for depression in stroke (Lincoln, Nicholl, Flannaghan, Leonard & Van der Gucht, in Press).

These issues from the literature were therefore taken into account in the choice of optimal measures of depression for the stroke population in the study.

A well-validated and commonly used measure of depression is the Hamilton Rating Scale for Depression (HRSD: Hamilton, 1967). This scale gives a measure of depression severity and was therefore appropriate for the study aims. It is also the most commonly used measure in the emotionalism literature, so was considered useful in the present study for comparison of results with previous findings and for potential meta-analyses of findings from a combination of studies. The scale consists of a brief, structured interview and was felt to be acceptable in length for use with in patients
It also uses the observational opinion of a rater, avoiding the potential problem of patients being unable to complete a self-report measure. The HRSD has been validated in medical and stroke populations (Robinson, 1993; Andersen, 1997). It is recommended for use by mental health professionals and its use was felt to be appropriate here as the researcher (SD) had several years experience in assessing depression in clinical settings. Additionally, there is a more structured version of the scale, developed for the National Institute for Mental Health Early Clinical Drug Evaluation Program (ECDEU: Klerman, Weissman, Rounsaville and Chevron, 1984), that has anchor points for rating different levels on each item and this was considered a useful adjunct to the original scale, giving more guidance on its completion (Appendix C). The specific probes for each item as recommended in Klerman et al. (1984) were also used for additional clarity on assessment. The HRSD was therefore felt to be a good choice for the study. However, it is recognised that the scale does suffer from the potential problem of somatic bias (Andersen, 1997) and there was therefore a query whether this may affect the interpretation of the relationship to emotionalism in the study.

In order to address the potential effect of somatic bias from the HRSD, the Hospital Anxiety and Depression Scale (HADS: Snaith & Zigmond, 1994: Appendix C) was also used in the study. The HADS is a commonly used measure designed for use with medical populations. As it is based on the concept of anhedonia, it is designed to reduce the potential bias from somatic items. The HADS also had the additional advantage of including an anxiety scale, which would provide information about the relationship between emotionalism and anxiety in stroke, without the need for an additional scale that would have increased the time needed for administration. The scale had the
disadvantage of being a self-report measure and therefore having potentially a lower response rate in a stroke population. However, every effort was made to allow as many participants as possible to complete the scale, by its presentation in large font and support with this from the researcher.

The use of both these depression measures was intended to provide comparative information on the assessment of depression in the study. The HADS would help to minimise somatic bias due to its development on the concept of anhedonia, whereas the HRSD has been used most frequently in emotionalism research and includes a broader range of depressive symptoms in its assessment. The use of both scales would also provide both self-report and observational information. Both measures can be scored to provide a measure of depression severity, as well as having established cutoffs for determining caseness. This method aimed to strengthen the research design by allowing comparison between rates obtained on the two measures and providing supplemental information as to the effect of depression measurement on the exploration of the relationship between emotionalism and depression.

**Emotionalism measures.**

From the review of the literature, it was found that the identification of emotionalism is made in varying ways across studies. Diagnosis is most often made by clinical judgement or interview (e.g. Muller, Murai, Bauer-Wittmund & von Cramon, 1999). Some authors also use a semi-structured interview (House et al. 1989) or diary (Allman, 1992). Interviews and clinical judgement decisions usually include the classically defined criteria from Poeck (1969), as described above. However, few studies apply
Poeck's criterion of 'dissociation' between the outwardly expressed emotion and the subjectively experienced and concurrent mood in emotionalism, which may be the most distinguishing feature of the condition (McCullagh & Feinstein, 2000). There are very few examples of emotionalism measurement scales that have psychometric information available for them at the moment, particularly scales specific to stroke populations. However, one emotionalism scale was identified that had been subject to a validation study with stroke patients. This is the 'Pathological Laughter and Crying Scale' (PLACS: Appendix C), developed by Robinson et al. (1993). The measure uses a likert-type scale to assess the main criteria of emotionalism and has items addressing the subjectively experienced affect that accompanies episodes of either laughing or crying in those suffering emotionalism. As well as having psychometric information available, the scale also provides a measure of severity of the condition and was considered to be of an acceptable length for administration.

The PLACS was therefore thought to be a good choice of assessment for the present study. However, it had not been used in either of the published studies into the relationship between emotionalism and depression that were the main precursors to the present study (House et al. 1989; Andersen, 1995). In these studies, the semi-structured interview by House et al. (1989) was used (Appendix C). This interview has been used in several stroke studies into emotionalism and is considered to be a reliable assessment of the condition by experts (House: personal correspondence). However, it has not been validated in a published study to date. It consists of a set of questions that address the main components of emotionalism, in order to guide a judgement as to the presence of the condition. In addition, an informal severity score was developed with the scale and used in Domone, (2000: unpublished Doctoral thesis). Validation information for
this scale is being produced in current research, but is not yet available. In order to achieve a balance in the choice of measures between validation information and results that would allow comparison with previous results related to the present study, it was therefore decided to use the PLACS and the House interview for the assessment of emotionalism. Again, the use of two measures was intended to provide information from comparison of their results. The inclusion of the House measure in the study was also made to provide preliminary psychometric information on its severity scale.

As discussed above, cognitive problems in people suffering stroke can interfere with the completion of measures, as some items in assessment may rely on the participants’ memory, which may be patchy in the immediate post-stroke period. It was therefore proposed to use an assessment of cognitive function using a section of the Cambridge Examination for Mental Disorders of the Elderly (CAMCOG-R: de Koning, Dippel, van Kooten & Koudstaal, 2000), as an adjunct to the depression and emotionalism scales, in order to assess for cognitive difficulties. However, in discussion with the Research and Development Organisational Committee, this measure was felt to be too long to administer. Therefore, an alternative approach was adopted, of consulting with care-staff as to whether potential participants had recognised cognitive difficulties that may interfere with their completion of the study measures. This was also further assessed by the researcher during explanation of the study to potential participants. If patients had problems with the completion of the consent form or measures due to cognitive or language difficulties, they were excluded from the study.

Translation of the study measures was also considered, as a large minority of the population in the geographical area were known to originate from the Indian sub-
continent and potentially be non-English speaking. This issue was discussed with an expert from a local voluntary agency who was familiar with the languages of the local population. No validated translations of the study measures were available and it was decided that informal translations would not be appropriate, partly because of questions about their reliability and partly as a number of different languages and dialects were spoken in the area. The advice was also received that many older people from ethnic minorities who were not able to speak English were also unlikely to be able to read, making written translations of limited use. The services of a translator were therefore sought provisionally in order that no participants would be excluded from the study, should they wish to take part. It was also considered probable that many patients in hospital or attending out-patient departments were likely to have someone available to translate for them, in order to understand their treatment. Arrangements were therefore made for the researcher to see such patients at times when their translators were available. Again in this case, data from participants that was obtained via translation was planned to be subject to initial analysis to check that their scores did not differ significantly from participants whose first language was English.

In comments from the local Ethics Committee it was felt that it was important for the researcher to be present during completion of study questionnaires, in order to support stroke patients with these. The advantages to this method were that the researcher would be available to explain the measures to participants, answer questions and if necessary, deal with distress if an episode of emotionalism were triggered by answering the study questions. An interview method with the researcher present also ensures that all participants that are given measures are entered in the study and so avoids the response bias commonly found in postal questionnaire methods. It also avoids the problem of
missing data, as the researcher can ensure that all items on the study measures are completed. However, a disadvantage to this method is that the study was only able to employ one researcher, which did not allow for separation of the study variables. There was not a free choice of method in this case, due to ethical requirements and study resources. Therefore, to reduce potential observer bias from the interview method, it was decided to use only participants that were able to complete the HADS without assistance, in order achieve an independent rating from this self-report measure, separate to the other study variables. The ability of as many participants as possible to complete the study measures without assistance was maximised by increasing the font of questionnaires and presenting these on a clipboard. The order of presentation of the measures was also considered carefully, with emotionalism as the dependent variable being assessed second, to reduce potential influence on the researcher's assessment of this. This method also followed that used in previous emotionalism studies by Allman, (1991) and House et al, (1989). Finally, the researcher scored the measures after participants were seen, to avoid knowledge of scores during interviews.

Information collected on demographics of the participants was kept to those details necessary to the aims of the study, to reduce the time for collecting data. Details of participants’ age, sex, first language and the presence of language problems was recorded on the Interview schedule sheet (Appendix C), along with the most recent information on their levels of disability where available, from the Barthel Activities of Daily Living Index (Mahoney & Barthel, 1965) which was routinely recorded in the medical notes. Clinical and radiological data from CT scans (where available) in the medical notes were used to determine the laterality of the stroke lesion.
3.4 Procedure

The study was approved by the relevant local ethical committees (Leicestershire & Rutland NHS Trust and University Hospitals of Leicester NHS Trust: Appendix A). The protocol was also reviewed by the local Research and Development Organisational Group and the supporting University Research and Assessment Committee. Staff from all the clinical areas involved in the study were consulted during the planning stage as to procedural decisions.

The study was supported by three Consultant Physicians who gave permission for patients under their care to be approached on wards and in out-patients.

A pilot of the study procedure and measures was undertaken in the out-patients department and rehabilitation centre to determine the acceptability of measures to participants and any necessary alterations to procedure. Following this, one alteration was made, that patients were to be given the study information one, rather than two, weeks prior to the researcher approaching them to discuss whether they wished to participate. This change was instigated due to patients being discharged in this two week period, before they could be seen to participate in the study. Patient reports also indicated that two weeks to consider their decision to participate was too long. This procedural change was approved by the Ethics Committee by Chair’s decision. As there were no other alterations to the procedure and measures, data from the pilot was included in the final sample, to maximize the sample size.

The study was introduced to all potential participants by printed information sheet (Appendix B) and covering letter from the relevant Consultant Physician responsible for
their care, one week prior to them being approached by the researcher. This information was included with their post-stroke out patient appointments, or given to them on the ward. The information sheet gave full details about the study and included a contact number in case patients had questions or wished to discuss the study at this point. All stroke patients on the out-patient clinic list for the days on which researcher attended were included and all stroke in-patients under the care of the Consultant Physicians supporting the study on wards. When approached, opportunity was given for explanation of the study from the researcher and any questions were answered. It was also discussed whether participants felt they may experience an episode of crying during completion of the measures and that they had the opportunity to withhold consent if they felt this was likely to be too distressing. Participants were interviewed for consent to participate in the out-patient department while waiting to be seen by the medical team, or at their bedside on the wards. If consent was given, questionnaires were administered by the researcher in a private room. Administration time of the questionnaires was 20-45 minutes, depending on time necessary for questions from participants and discussion after completion. If an episode of crying was experienced, this was discussed and reassurance given, and the participant given time to regain composure before the researcher left.

Following completion of each interview, participants were given a letter thanking them for their contribution to the study, which outlined details of how the results of the study can be obtained if wished and gave a contact number in case of later questions (Appendix C). Individual feedback on participants’ results was also offered. The interview schedule sheet was completed (Appendix C) and medical notes of participants
consulted to ascertain available information on the type of stroke and location of the stroke lesion, as recorded from the written report of the CT scan.

All patient information was kept in anonymised form using patient study numbers for identification. Storage of electronic and written patient information adhered to guidelines of the Data Protection Act (1998). Data was scored and analysed following the procedure.
Results
4.0 Results

4.1 Overview

The study data were analysed using SPSS 11.0 for Windows. A flowchart and summary of the analysis are given below.

Figure 2: Flowchart of the stages of the study analysis.

<table>
<thead>
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<th>Preliminary Analyses:</th>
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<td>Sample Characteristics</td>
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Data Screening

Analysis of Differences Between the Sample Subgroups: In-patients and Out-patients and non-English language

Reliability Analysis of Measures

↓

Hypothesis 1:
Factor Analysis

↓

Hypotheses 2 and 3:
Correlational Analysis

↓

Hypotheses 4a,b,c:
Comparison of Rates Obtained From the Different Study Measures: Depression and Emotionalism

↓

Description of Subgroup Combinations of Emotionalism and Depression

The characteristics and demographics of the sample were firstly described. Descriptive data of the emotionalism, depression and anxiety scales were then produced and screened for acceptability for the assumptions of the statistical methods to be used.

As participants were recruited from two populations of in-patients and out-patients, analysis was then conducted to determine whether there were significant differences in
mean scores between these two populations, on any of the study measures, that may create bias and affect the reliability of the subsequent analyses. As no significant differences were found, these two samples were collapsed into one. An analysis was also conducted to test for significant differences in scores between participants whose first language was or was not English. As no significant differences were found, data from participants whose first language was not English was included in the sample for analysis.

A reliability analysis of the study measures was then conducted, followed by factor analysis to test Hypothesis 1, that separate factors corresponding to the constructs of emotionalism and depression would be extracted from the study measures. A correlational analysis was then performed to test Hypotheses 2 and 3, that emotionalism would be positively related to both depression and anxiety, controlling for associations with other non-psychological variables. Next, the rates of depression and emotionalism rates in the sample were calculated and the McNemar test was used to investigate hypotheses 4a, b, and c, that there would be differences in the rates observed from the different measures of emotionalism and depression. Finally, charts were produced to demonstrate the co-occurrence of emotionalism and depression in the sample. The Pathological Laughter and Crying Scale (PLACS) was used as the primary measure of emotionalism in the analyses, as this scale has the best available validation information to date. The House interview and severity scale (House) was used to test hypotheses 4b and included in the other analyses to provide psychometric information on it, from the comparison with the PLACS.

Abbreviations of the titles of the study measures are used throughout as:
The Hospital Anxiety and Depression Scale: anxiety subscale (HADS-A),
The Hospital Anxiety and Depression Scale: depression subscale (HADS-D), Hamilton Rating Scale for Depression (HRSD), Pathological Laughter and Crying Scale: total score (PLACS-T): Pathological Laughter and Crying Scale: laughter subscale (PLACS-L) Pathological Laughter and Crying Scale: crying subscale (PLACS-C) and House interview (House).

The main findings from the analysis are reported in the text, with additional tables and figures in Appendix E.

4.2 Preliminary analyses

Sample characteristics

60 participants were seen to complete the study measures. Of these, one participant was fatigued during the interview and completed only two measures, the House interview for emotionalism and the HADS measure for anxiety and depression. Data from this participant was included in the analyses where possible, but was automatically excluded from some analyses by the SPSS program. There were no other missing data. The age range of the sample was 36 to 84 years, mean 68 (standard deviation: 11.2). Sixty-three percent of the participants were male and 37% female. Scores from the Barthel Index in clinical records were available for 49 participants and scores ranged from 4 to 20, mean 13.6 (standard deviation: 5.26). Information from the medical notes or clinical staff reports recorded that 23 (38%) of the participants had dysphasia. Participants were seen at varying time since their stroke, ranging from 2-208 weeks, mean 26 weeks (standard deviation: 42).
Information from CT scan reports and medical notes recorded that 46 (76.7%) of participants had ischaemic stroke, 10 (16.7%) had haemorrhagic stroke and 3 (5%) had both. Thirty (50%) of participants had right-sided stroke, 21 (35%) left-sided stroke and 9 (15%) had bilateral strokes.

Fifty-four (90%) of participants reported their first language as English, 4 (6.7%) as Gujarati and 2 (3.3%) as another Indian language.

The sample comprised of 30 in-patients and 30 out-patients. Nineteen (31.7%) of the participants were seen at the Leicester Royal Infirmary, 33 (55%) at the Leicester General Hospital and 8 (13.3%) at Coalville Community Hospital.

Data screening

The study measures were divided into their subscales and analysed separately where appropriate. The HADS has subscales for anxiety and depression and these are shown separately. The PLACS has scales for pathological laughter and pathological crying, which are shown separately. The PLACS total score was also used to give an overall index of pathological emotionalism for some analyses. Descriptives of these study measures are summarized below in Table 1. One case had missing data and was omitted automatically from some analyses by the SPSS program, giving a sample size of 59 for some analyses and 60 for others.
Table 1: Descriptive statistics of the study measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>N</th>
<th>Range</th>
<th>Mean</th>
<th>Std Dev</th>
<th>Var.</th>
<th>Skew</th>
<th>Kurt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS-A scale</td>
<td>60</td>
<td>18.0</td>
<td>7.23</td>
<td>4.13</td>
<td>17.10</td>
<td>.40</td>
<td>-.49</td>
</tr>
<tr>
<td>HADS-D scale</td>
<td>60</td>
<td>18.0</td>
<td>7.28</td>
<td>4.31</td>
<td>18.54</td>
<td>.38</td>
<td>-.42</td>
</tr>
<tr>
<td>HRSD total</td>
<td>59</td>
<td>25.0</td>
<td>11.15</td>
<td>6.57</td>
<td>43.23</td>
<td>.68</td>
<td>-.39</td>
</tr>
<tr>
<td>PLACS-L scale</td>
<td>59</td>
<td>18.0</td>
<td>1.89</td>
<td>3.53</td>
<td>12.47</td>
<td>3.24</td>
<td>11.37</td>
</tr>
<tr>
<td>PLACS-C scale</td>
<td>59</td>
<td>18.0</td>
<td>4.35</td>
<td>4.99</td>
<td>24.96</td>
<td>.81</td>
<td>-.42</td>
</tr>
<tr>
<td>PLACS-Total</td>
<td>59</td>
<td>32.0</td>
<td>6.25</td>
<td>7.04</td>
<td>49.54</td>
<td>1.56</td>
<td>-2.81</td>
</tr>
<tr>
<td>House scale</td>
<td>60</td>
<td>16.0</td>
<td>4.02</td>
<td>4.01</td>
<td>16.08</td>
<td>.54</td>
<td>-.35</td>
</tr>
</tbody>
</table>

The Hospital Anxiety and Depression Scale: anxiety subscale (HADS-A), The Hospital Anxiety and Depression Scale: depression subscale (HADS-D), Hamilton Rating Scale for Depression (HRSD), Pathological Laughter and Crying Scale: total score (PLACS-T): Pathological Laughter and Crying Scale: laughter subscale (PLACS-L) Pathological Laughter and Crying Scale: crying subscale (PLACS-C) and House interview (House). N=number of participants; Std Dev=Standard deviation; Var=Variance; Kurt=Kurtosis.

Data screening was then carried out. Boxplots, Normal Q-Q plots and descriptive statistics were inspected for the measures to determine whether they met the assumptions of normal distribution and homoscedasticity for parametric analyses. There was found to be significant skew and kurtosis on the PLACS laughter subscale and PLACS total scale. Inspection of boxplots for these scales revealed the presence of two outliers on the PLACS laughter scale and to a lesser extent on the PLACS total scale (Appendix E, Figure 1). Removal of the two cases did not resolve the skew. Tabachnick & Fidell (1996) therefore recommend transformation of ungrouped data to reduce the impact of outliers and normalise the distribution in this case. Natural log transformation of the PLACS laughter and total scales was performed. This resulted in skew and kurtosis being reduced below the level of significance of z = >2.58 for the PLACS total scale (Clarke-Carter, 1997). Skew was reduced but not completely resolved on the
PLACS laughter scale, although the distribution of this scale was improved and kurtosis was resolved. A boxplot and descriptives for these two scales after transformation is shown in Appendix E, Figure 2. As a degree of skew remained on the PLACS laughter scale, this was not used in parametric tests. Such analyses were performed with the PLACS total scale, after checking the other individual assumptions for the tests in each case. The PLACS laughter scale was included in the non-parametric correlational analysis.

Analysis of differences between the subgroups in the sample:

**In-patients and out-patients**

As participants were recruited from two populations of in-patients and out-patients, an analysis was conducted to determine whether there were differences in scores between these two populations, on any of the study measures, that may affect the reliability of further analyses. A MANOVA procedure with Bonferroni correction was used for this analysis. Levene’s test was non-significant for the five study measures, showing that they met the assumption for homogeneity of variance for the MANOVA procedure. Analysis of each individual dependent variable, using a Bonferroni adjusted alpha level of $p > 0.01$, showed that there were no significant differences between in-patients and out-patients on any of the study measures: HADS depression scale ($F(1,56) = 0.28$, $p= 0.60$), HADS anxiety scale ($F(1,56) = 0.31$, $p= 0.58$), HRSD ($F(1,56) = 1.38$, $p= 0.25$), PLACS-T ($F(1,56) =2.54$, $p= 0.12$) and House measure ($F(1,56) =1.49$, $p= 0.23$). MANOVA statistics for each of the dependent variables are summarised below in Table 2. Mean scores on the measures for in-patients and out-patients respectively are shown in Appendix E, Table 1.
As there were no significant differences between the two subgroups, they were collapsed into one.

Table 2: MANOVA and Levene’s test statistics for in-patient and out-patient between-group differences on the five study variables in the sample.

<table>
<thead>
<tr>
<th>Levene’s Test:</th>
<th>MANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
</tr>
<tr>
<td>HADS-D</td>
<td>2.59</td>
</tr>
<tr>
<td>HADS-A</td>
<td>.03</td>
</tr>
<tr>
<td>HRSD</td>
<td>.01</td>
</tr>
<tr>
<td>PLACS-T</td>
<td>2.18</td>
</tr>
<tr>
<td>House</td>
<td>2.92</td>
</tr>
</tbody>
</table>

The table shows Levene’s test F value (F) and significance levels (Sig.), MANOVA sum of squares, degrees of freedom (df), F values (F) and observed significance levels (Sig.*), for all five measures. (*adjusted p value = 0.01. Labels for the measures as in Table 1).

Language subgroup analysis

An analysis was also conducted to determine whether there were differences in scores on the study measures between participants whose first language was, or was not English. As the numbers of participants in these two subgroups were very unequal, Pearson’s Chi-squared test was used to examine expected and observed frequencies of the study measures. For this analysis, the study measures were recoded into categorical variables using recommended cutoffs for the identification of depression and emotionalism in stroke populations. For the HADS, the optimal cutoff level for identifying depression and anxiety in medical populations is suggested to be 8 (Bjelland, Dahl, Haug & Neckelmann, 2002). For the HRSD, the cutoff levels is given as 17 for a classification of ‘Major Depression’ (Klerman, Weissman, Rounsaville, & Chevron, 1984). The House criteria were used to categorise participants into those with
or without emotionalism, as shown in Appendix and the recommended cutoff level of 13 was used for the PLACS (Robinson et al. 1993). Fisher’s exact significance test was used as more than 2 cells had an expected count of less than 5. No significant differences were found between participants’ scores on any of the four measures, related to whether their first language was English: HADS depression scale (Pearson’s chi-squared $\chi^2 = 0.367$, df = 1, $p = 0.681$, non-significant), HADS anxiety scale (Pearson’s chi-squared $\chi^2 = 1.714$, df = 1, $p = 0.386$, non-significant), HRSD (Pearson’s chi-squared $\chi^2 = 1.705$, df = 1, $p = 0.33$, non-significant), PLACS total score (Pearson’s chi-squared $\chi^2 = 0.107$, df = 1, $p = 0.819$, non-significant), House measure (Pearson’s chi-squared $\chi^2 = 0.98$, df = 1, $p = 0.904$, non-significant). The results of this analysis are summarised below in Table 3. Observed and expected frequencies of depression, anxiety and emotionalism for the two subgroups in this analysis are shown in Appendix E, Tables 2 to 6.

As there were no significant differences between scores from the two subgroups, they were collapsed into one for subsequent analyses.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pearson’s Chi-square</th>
<th>df</th>
<th>Fisher’s Exact Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS-D</td>
<td>0.37</td>
<td>1</td>
<td>0.68</td>
</tr>
<tr>
<td>HADS-A</td>
<td>1.71</td>
<td>1</td>
<td>0.39</td>
</tr>
<tr>
<td>HRSD</td>
<td>1.70</td>
<td>1</td>
<td>0.33</td>
</tr>
<tr>
<td>PLACS-T</td>
<td>0.11</td>
<td>1</td>
<td>0.82</td>
</tr>
<tr>
<td>House</td>
<td>0.10</td>
<td>1</td>
<td>0.90</td>
</tr>
</tbody>
</table>

The table shows: Pearson’s chi-squared statistic (Pearson’s Chi-square), degrees of freedom (df) and significance levels (Fisher’s exact sig).
Reliability analysis of the study measures

The measures of depression and emotionalism were then examined to determine whether their items were consistent with each other, indicating that each was measuring one construct. Internal consistency of the study measures was assessed using Cronbach’s alpha reliability coefficient. This analysis indicated that internal reliability for all scales and subscales was acceptable, with alpha levels above 0.7 in each case (Clark-Carter, 1997). It was therefore concluded that the measures were each relating to a single construct. (The PLACS was assessed as three separate scales for this analysis, to give information on the properties of each). Information on the scales is summarised in Table 4 below.

Table 4: Inter-item correlations for each of the study measures.

<table>
<thead>
<tr>
<th>No. of Variables</th>
<th>Mean</th>
<th>Variance</th>
<th>SD</th>
<th>Alpha</th>
<th>Standardized item alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS-A</td>
<td>7</td>
<td>7.23</td>
<td>17.10</td>
<td>4.13</td>
<td>.77</td>
</tr>
<tr>
<td>HADS-D</td>
<td>7</td>
<td>7.28</td>
<td>18.54</td>
<td>4.31</td>
<td>.73</td>
</tr>
<tr>
<td>HRSD</td>
<td>17</td>
<td>11.15</td>
<td>43.23</td>
<td>4.31</td>
<td>.76</td>
</tr>
<tr>
<td>PLACS L</td>
<td>9</td>
<td>1.90</td>
<td>12.47</td>
<td>3.53</td>
<td>.83</td>
</tr>
<tr>
<td>PLACS C</td>
<td>9</td>
<td>4.36</td>
<td>24.96</td>
<td>4.99</td>
<td>.82</td>
</tr>
<tr>
<td>PLACS-T</td>
<td>18</td>
<td>6.26</td>
<td>50.49</td>
<td>7.10</td>
<td>.85</td>
</tr>
<tr>
<td>House</td>
<td>4</td>
<td>4.02</td>
<td>16.08</td>
<td>4.01</td>
<td>.91</td>
</tr>
</tbody>
</table>

(SD=Standard Deviation).
4.3 Hypothesis 1: Factor analysis

Factor analysis of participants’ scores from the emotionalism and depression measures will extract two factors, corresponding to the two conditions.

As internal consistency of each of the measures was considered acceptable, an analysis was then conducted to determine whether the measures of emotionalism and depression appeared to be measuring separate constructs and were not confounding the two conditions. A factor analysis using Principle Components Extraction with varimax rotation was performed at scale level to test the hypothesis that the measures of emotionalism and depression would produce two factors corresponding to these constructs.

The four measures’ total scores were entered as variables, with a sample size of 60, giving a 15:1 participant to variable ratio. The results were inspected for violation of assumptions of the analysis. Bartlett’s Test of Sphericity was significant, but as there was more than a 5:1 participant to variable ratio, this test was considered probably too sensitive to prove the factorability of the data (Brace, Kemp & Snelgar, 2003). The Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .54, which was above the acceptable level (Tabachnick & Fidell, 1996). Linearity was shown from significant correlations above the level of 0.3 in the initial correlation matrix. Partial correlations between the variables were all lower than the correlations, suggesting that underlying factors were present. All KMO values for the variables from the anti-image matrix were above .5, so all were retained in the analysis.

Two factors were extracted with eigenvalues above 1. Factor 1 accounted for 53.3% of the variance in the model and Factor 2 accounted for 31.5% of the variance. Factor statistics are given below in Table 5 and the Factor loadings are shown below in Table 6. Additional data from the scree plot are shown in Appendix E, Figure 3.
Table 5: Eigenvalues and amount of variance explained by each of the two extracted factors.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Percentage of variance explained</th>
<th>Cumulative percentage of variance explained</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.13</td>
<td>53.3</td>
<td>53.3</td>
</tr>
<tr>
<td>2</td>
<td>1.26</td>
<td>31.5</td>
<td>84.8</td>
</tr>
</tbody>
</table>

Table 6: Factor loadings from the varimax rotation matrix, for the two extracted factors.

<table>
<thead>
<tr>
<th>Factor</th>
<th>HADS-D</th>
<th>HRSD</th>
<th>House severity scale</th>
<th>PLACS Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>.12</td>
<td>.10</td>
<td>.92</td>
<td>.96</td>
</tr>
<tr>
<td>Factor 2</td>
<td>.88</td>
<td>.88</td>
<td>.23</td>
<td>.02</td>
</tr>
</tbody>
</table>

The two depression total scales were found to have high loadings on Factor 2 and low loadings on factor 1. An appropriate label for factor 2 was therefore proposed as ‘Depression score’. The two emotionalism total scales were found to have high loadings on Factor 1 and low loadings on Factor 2. The label for factor 1 was therefore suggested as ‘Emotionalism score’. Two factors corresponding to the constructs of emotionalism and depression were therefore extracted.

It was concluded that the measures for emotionalism and depression were identifying separate constructs and hypothesis 1 was supported.
4.4 Hypotheses 2 and 3: Correlational analysis

Hypothesis 2: Correlation between emotionalism and depression scores

2a: Participants’ scores for emotionalism and depression will be significantly positively correlated

2b: Depression scores will account for variance in emotionalism scores, after controlling for associations with non-psychological variables.

Hypothesis 3: Correlation between emotionalism and anxiety scores

Participants’ scores for emotionalism and anxiety will be significantly positively correlated.

As the constructs of emotionalism and depression therefore appeared to be separable from the results of the factor analysis, further analysis was performed to examine the relationship between them. A correlational analysis was conducted to examine the relationship between participants’ scores on the emotionalism, depression and anxiety measures and test the hypotheses that participants’ emotionalism scores would be positively correlated with both depression and anxiety scores.

As part of the same hypotheses, the relationship between emotionalism scores and the non-psychological variables in the study was also examined, to assess whether these would be correlated with emotionalism to a greater degree than the psychological variables. Participants’ age, gender, time since stroke and lesion laterality were the relevant variables suggested to be related to emotionalism from previous research (as discussed in the introduction) and these were also entered into the analysis.

A non-parametric test (Spearman’s rho) was used to assess the correlations between the study measures, as the PLACS-L was to be included in the analysis and this subscale did not meet the assumption of normality required for parametric statistics. Scatterplots
of the relationships between each of the study variables were firstly examined and did not suggest presence of outliers that may affect the correlations. The variables of participants’ age and time since stroke were also entered into this correlation matrix, as the data was at ratio level. (As an adjunct to this analysis, a parametric test of correlation (Pearson’s r) was also performed on the same data to examine the effect of the greater power of this test on the relationships being examined, as an additional check on the findings. This additional analysis is not reported as part of the study results but was conducted to provide additional information towards future research and is shown in Appendix E, Table 7).

As gender and lesion laterality were nominal data, their relationships with emotionalism scores were assessed using Cramer’s phi (Clarke-Carter, 1996). The PLACS and House results were recoded into categorical variables for this analysis, using the recommended cutoff of 13 for the PLACS and the House criteria (as above), to categorise participants into those with or without emotionalism. Fisher’s exact significance test was used as more than 2 cells had an expected count of less than 5. One-tailed tests were used, for directional hypotheses.

The full correlation matrix is given below in Table 7 and the significant results from the correlational analysis, as related to the study hypotheses are summarised in Table 8.
<table>
<thead>
<tr>
<th></th>
<th>HADS-A</th>
<th>HADS-D</th>
<th>HRSD</th>
<th>PLACS-L</th>
<th>PLACS-C</th>
<th>PLAC-T</th>
<th>House</th>
<th>Age</th>
<th>Time since stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS (A)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Spear. rho</td>
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<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Sig.</td>
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<td></td>
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<tr>
<td>Sig.</td>
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<tr>
<td>HRSD</td>
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<tr>
<td>Spear. rho</td>
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<tr>
<td>Sig.</td>
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<td></td>
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<tr>
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<td>.234*</td>
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<td>.019</td>
<td>.037</td>
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</tr>
<tr>
<td>PLACS-T</td>
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</tr>
<tr>
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<td>.179</td>
<td>.526**</td>
<td>.929**</td>
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<td></td>
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<td>.000</td>
<td>.000</td>
<td></td>
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</tr>
<tr>
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</tr>
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<td>.253*</td>
<td>.195</td>
<td>.911**</td>
<td>.835**</td>
<td>1.00</td>
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<td>Sig.</td>
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<td>.070</td>
<td>.000</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spear. rho</td>
<td>-.214</td>
<td>-.225*</td>
<td>-.125</td>
<td>.006</td>
<td>-.221*</td>
<td>-.173</td>
<td>-.221*</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Sig.</td>
<td>.050</td>
<td>.042</td>
<td>.174</td>
<td>.482</td>
<td>.046</td>
<td>.094</td>
<td>.044</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time since stroke</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spear. rho</td>
<td>-.057</td>
<td>.075</td>
<td>.153</td>
<td>.313**</td>
<td>.104</td>
<td>.189</td>
<td>.051</td>
<td>-.142</td>
<td>1.00</td>
</tr>
<tr>
<td>Sig.</td>
<td>.334</td>
<td>.285</td>
<td>.126</td>
<td>.008</td>
<td>.217</td>
<td>.076</td>
<td>.349</td>
<td>.139</td>
<td></td>
</tr>
</tbody>
</table>

Table 7: Correlation matrix for the study measures, age and time since stroke *Correlation significant at the 0.05 level and ** 0.01 level (1-tailed)
Table 8: Summary of significant positive (+) and negative (-) Spearman’s rho coefficient correlations between emotionalism, depression and anxiety scores.

<table>
<thead>
<tr>
<th>Emotionalism measures:</th>
<th>PLACS-T</th>
<th>PLACS-C</th>
<th>PLACS-L</th>
<th>House</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS-A</td>
<td>0.25 (+)</td>
<td>0.31 (+)</td>
<td></td>
<td>0.34 (+)</td>
</tr>
<tr>
<td>HADS-D</td>
<td></td>
<td></td>
<td>0.30 (-)</td>
<td>0.23 (+)</td>
</tr>
<tr>
<td>HRSD</td>
<td>0.31 (+)</td>
<td></td>
<td>0.25 (+)</td>
<td></td>
</tr>
</tbody>
</table>

The relationship between emotionalism and depression

There was a significant positive correlation between emotionalism and depression, as measured by PLACS crying subscale and the HRSD (rho = 0.311, N = 59, p = 0.019, one-tailed). Pathological crying was therefore found to be positively associated with depression. The effect size for this correlation was 0.31, which Cohen (1988) judges to be a medium effect, accounting for 9% of the variance.

There was a significant negative correlation between emotionalism and depression, as measured by the PLACS laughter subscale and the HRSD (rho = -0.298, N = 59, p = 0.011, one-tailed). Pathological laughter was therefore found to be negatively associated with depression. The effect size for this correlation was 0.25, accounting for 6% of the variance.

There was no significant correlation between pathological emotionalism total scores and depression. As an additional analysis, a parametric test of correlation was also conducted on the same data here, to verify whether this non significant result may have been due to the use of an analysis with less power. The correlation between pathological emotionalism total scores and depression was also found to be non significant using Pearson’s correlation coefficient. This additional analysis is not reported formally as part of the results of the study but is shown in Appendix E, Table 7.
There was therefore partial support for hypothesis 2a: pathological crying was significantly positively correlated with depression, but pathological laughter and depression were significantly negatively correlated. There was no significant correlation between depression and total scores for pathological emotionalism.

The relationship between emotionalism and non psychological variables:

There was a significant positive correlation between pathological laughter as measured by the PLACS laughter scale and time since stroke (\( \rho = 0.313, N = 60, p = 0.008, \) one-tailed), but no other significant correlation between emotionalism and time. It was therefore found that pathological laughter scores increased over time.

There were no significant correlations between gender and emotionalism as measured by the PLACS total scale (\( \phi = -0.064, N = 60, p = 0.618 \)), or the House severity scale (\( \phi = -0.132, N = 59, p = 0.31 \)), nor between laterality of stroke lesion and emotionalism as measured by the PLACS total scale (\( \phi = 0.117, N = 59, p = 0.666 \)), or the House severity scale (\( \phi = -0.048, N = 60, p = 0.94 \)).

There was a significant negative correlation between age and emotionalism as measured by the PLACS crying scale (\( \rho = -0.221, N = 59, p = 0.046, \) one-tailed) and the House scale (\( \rho = -0.221, N = 60, p = 0.044, \) one-tailed). Pathological crying scores were therefore found to be higher in younger participants.

Other significant correlations:

There was a significant negative correlation between age and depression as measured by HADS depression scale, (\( \rho = -0.225, N = 60, p = 0.042, \) one-tailed). Depression
scores were therefore found to be higher in younger participants. Younger participants therefore had higher scores on both pathological crying (PLACS-C) and depression (HRSD) measures.

**Partial correlations**

As age was found to correlate negatively with both pathological crying and depression, partial correlations were computed to examine how much of variance in emotionalism scores was accounted for by depression, controlling for the contribution of age.

<table>
<thead>
<tr>
<th></th>
<th>HRSD</th>
<th>PLACS-C</th>
<th>House</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HRSD</strong></td>
<td>Spear. rho</td>
<td>Sig.</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>PLACS-C</strong></td>
<td>Spear. rho</td>
<td>Sig.</td>
<td>.273*</td>
</tr>
<tr>
<td><strong>House</strong></td>
<td>Spear. rho</td>
<td>Sig.</td>
<td>.260*</td>
</tr>
</tbody>
</table>

*Spear. rho= Spearmann’s rho correlation coefficient, Sig.=significance, *Correlation significant at the 0.05 level and ** 0.01 level (1-tailed)*

The positive correlation between pathological crying as measured by the PLACS-C and depression as measured by the HRSD with age partialled out was still statistically significant (rho = 0.273, df = 55, p = 0.020, one-tailed test). It was therefore found that variance in depression scores accounts for 7.5% of the variance in emotionalism scores, after removing the percentage of variance accounted for by age.
Therefore Hypothesis 2b was supported: Depression scores were found to account for variance in emotionalism scores, after controlling for associations with non-psychological variables.

The relationship between emotionalism and anxiety

There was a significant positive correlation between emotionalism and anxiety as measured by the HADS anxiety scale and both the PLACS total score (rho = 0.251, N = 59, p = 0.027, one-tailed) and the PLACS crying subscale (rho = 0.306, N = 59, p = 0.009, one-tailed). Pathological crying and the pathological emotionalism total scores were therefore found to be positively associated with anxiety. Effect sizes for these correlations were 0.31 and 0.251 respectively, accounting for 6-9% of the variance.

There was no significant correlation between emotionalism and anxiety as measured by the HADS anxiety scale and the PLACS laughter scale. There was therefore no relationship between pathological laughter and anxiety.

Hypothesis 3 was therefore partially supported: Pathological crying and pathological emotionalism total scores were significantly positively correlated with anxiety. There was no relationship between anxiety and pathological laughter.

Additional correlations between the measures

The depression and anxiety subscales of the HADS were highly correlated and both HADS subscales were highly correlated with the HRSD. All measures of depression and anxiety were therefore correlated with one other.
The PLACS total score was positively correlated with its laughter and crying subscales. The PLACS total scale and PLACS crying scale were positively correlated with the House severity scale, but there was no significant correlation between the House scale and the PLACS laughter scale.

The House severity scale was included in these analyses to assess the performance of the scale in comparison with the PLACS. Scores from this measure were significantly correlated with depression scores, as measured by both the HRSD (\(\rho = 0.253, N = 59, p = 0.028\), one-tailed) and the HADS depression scale (\(\rho = 0.226, N = 60, p = 0.02\), one-tailed). The House scale was also significantly correlated with anxiety (\(\rho = 0.337, N = 60, p = 0.004\), one-tailed).

### 4.5 Hypothesis 4: Effect of different methods of assessment of emotionalism and depression

4a: Different rates of emotionalism will be obtained from different measures of this condition.

4b: Different rates of depression will be obtained from different measures of this condition.

4c: Different measures used to assess emotionalism and depression will affect the statistical associations between the conditions

**Rates of emotionalism**

The hypothesis that there would be different rates of emotionalism obtained from the PLACS- T and the House criteria was tested using the McNemar test for binomial distribution. Rates of emotionalism in the sample were calculated using the recommended cutoff level of 13 for the PLACS (Robinson et al. 1993) and the criteria
for the House measure (House et al. 1989: Appendix). The rates obtained are shown in Table 10 below.

Table 10: Crosstabulations of frequency counts of emotionalism in the sample, as assessed by the PLACS and the House measure.

<table>
<thead>
<tr>
<th></th>
<th>House Measure</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No E</td>
</tr>
<tr>
<td>PLACS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No E</td>
<td>46</td>
<td>4</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td>13</td>
</tr>
</tbody>
</table>

The McNemar test showed no significant difference between rates of emotionalism in the study sample from the PLACS-T and House interview (N = 59, exact p = 0.375). Therefore, rates of emotionalism were different from the two measures, with more participants being classified as having emotionalism on the House measure, than on the PLACS, but this difference in rates did not reach statistical significance.

**Hypothesis 4a was therefore not supported: significantly different rates of emotionalism were not obtained from the two measures of emotionalism.**

**Rates of depression**

The hypothesis that there would be different rates of depression obtained from the Hospital Anxiety and Depression Scale: depression subscale (HADS-D) and the Hamilton Rating Scale for Depression (HRSD) was also tested using the McNemar test for binomial distribution. Rates of depression and anxiety in the sample were firstly calculated using the recommended cutoff scores for each measure. For the HADS, the
optimal cutoff level for medical populations is suggested to be 8 (Bjelland, Dahl, Haug & Neckelmann, 2002)). For the HRSD, cutoff levels are stated at 13-17 for ‘less than Major Depression’ and 17 for ‘Major Depression’ (Klerman, Weissman, Rounsaville, & Chevron, 1984). Frequencies for both the HRSD cutoff levels were calculated and obtained rates from the measures are shown below in Table 11.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Cutoff level</th>
<th>Frequency Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS (A)</td>
<td>8</td>
<td>25</td>
<td>41.7</td>
</tr>
<tr>
<td>HADS (D)</td>
<td>8</td>
<td>27</td>
<td>45.0</td>
</tr>
<tr>
<td>HRSD</td>
<td>17</td>
<td>12</td>
<td>20.0</td>
</tr>
<tr>
<td>HRSD</td>
<td>13-17</td>
<td>23</td>
<td>38.3</td>
</tr>
</tbody>
</table>

Counts and percentages were assessed using recommended cutoff rates for the population. Rates for the HRSD from both the higher (17) and lower (13-17) cutoff levels are given.

Rates of depression in the study were 20% for a classification of major depression on the HRSD, 38% for minor depression on the HRSD and 45% on the HADS-D. These rates are within those usually reported for stroke populations, which are found to vary between 25-79% (Kneebone & Dunmore, 2000). Rates of generalised anxiety disorder (GAD) have been reported as 27% in a stroke population, with an additional 14% of participants having symptoms of anxiety but not reaching the criteria for GAD (Castillo, Starkstein, Fedoroff, Price & Robinson, 1993). Rates of anxiety as assessed on the HADS-A were therefore higher in this sample, than the reported rates of GAD in stroke patients.

The McNemar test showed a significant difference between rates of depression in the study sample from the HADS-D and HRSD at the cutoff level of 17 (N = 59, exact p =
0.004), but no difference between the rates of depression found using the HADS-D and the lower cutoff level of 13 for the HRSD (N = 59, exact p = 0.664). It was therefore found that the lower cutoff level for the HRSD found very similar rates of depression in the sample to the HADS depression scale. However, rates of depression were significantly lower on the HRSD than the HADS, when the more stringent cutoff level for a classification of 'major depression' was used.

Hypothesis 4b was therefore supported: different rates of depression were obtained from the two measures of depression.

Hypothesis 4C was supported: from the correlational analysis above, different associations between emotionalism and depression were obtained from the different study measures.

4.6 Description of Subgroup Combinations of Emotionalism and Depression

Finally, the rates of emotionalism and depression obtained from the four study measures as above in Tables 10 and 11 were then combined to show the co-occurrence of emotionalism and depression amongst participants in the study. Participants’ scores on the measures of emotionalism and depression were recoded into categorical variables using recommended cutoffs for the identification of depression and emotionalism in stroke populations, as above. Frequencies of participants with emotionalism alone, depression alone, neither emotionalism nor depression and co-occurring emotionalism and depression were produced. Values for these four subgroups are shown in Figures 12 to 15 below.
As above, the rates of emotionalism and depression vary according to which measure is used and the four combinations of the measures are therefore shown. The majority of participants in the study had neither emotionalism nor depression and there were a very small number of participants with a co-occurrence of depression and emotionalism.
Figures 12 to 15: Co-occurrence of emotionalism and depression amongst participants in the study, from the four study measures.

<table>
<thead>
<tr>
<th>Table 12: HRSD and House</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>No E, No D</td>
</tr>
<tr>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 13: HRSD and PLACS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>No E, No D</td>
</tr>
<tr>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 14: HADS-D and House</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>No E, No D</td>
</tr>
<tr>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 15: HADS-D and PLACS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>No E, No D</td>
</tr>
<tr>
<td>30</td>
</tr>
</tbody>
</table>
Discussion
5.0 Discussion

In this section, the results of the study are summarised, then discussed in relation to each of the hypotheses in turn and interpreted with reference to the relevant research literature. The clinical implications of the findings are then discussed and methodological limitations of the study considered. Finally, psychometric information about the study measures is summarized and implications for further research are suggested. The Pathological Laughter and Crying Scale (PLACS) is discussed as the primary measure of emotionalism in the analyses. Results from the House scale are discussed in relation to hypothesis 4b and the summary of psychometric information, from its comparison with the PLACS.

5.1 Summary of findings

A factor analysis was conducted to test the hypothesis that the measures of emotionalism and depression would produce two factors corresponding to these two conditions, to suggest that they are in fact, measuring separate constructs.

For this analysis, the inter-item correlations of the study measures were firstly calculated, to determine whether each was measuring a unitary construct. Internal consistency was high for all measures, with inter-item correlations all equal to or greater than 0.7 (Clark-Carter, 1997). It was therefore considered valid to proceed with the factor analysis to examine the factor loadings of participants’ scores from the emotionalism and depression scales. The results from this analysis found that two factors were extracted from the emotionalism and depression scores, with scores from the two depression measures having high loadings on one factor and scores from the two emotionalism measures having high loadings on the other. This suggests that the
measures of emotionalism and depression do not confound the conditions and are measuring separate constructs. Hypothesis 1 was therefore supported. As emotionalism and depression were found to be separable by the measures used in the study, an analysis was then conducted to examine the relationship between them.

Depression was found to be positively associated with pathological crying, accounting for 9% of the variance in participants’ scores on the PLACS-C. However, depression was found to be negatively associated with pathological laughter and there was no significant correlation between depression and total scores for pathological emotionalism with the crying and laughter subscales combined. These findings therefore provided partial support for Hypothesis 2a, with different results being found from the subscales of the PLACS.

No significant correlations were found between emotionalism and gender or lesion laterality, but pathological crying scores were found to be higher in younger participants. As depression scores were also found to be higher in younger participants, partial correlations were computed to examine whether depression still accounted for variance in emotionalism scores, after controlling for the contribution of age. It was found that variance in depression scores accounted for 7.5% of the variance in emotionalism scores, after removing the percentage of variance accounted for by age. Hypothesis 2b was therefore supported, as depression scores accounted for variance in emotionalism scores, after controlling for associations with non-psychological variables.
Anxiety was found to be positively associated with pathological crying and total scores for pathological emotionalism, accounting for 6-9% of the variance of emotionalism scores on these measures. No significant relationship was found between anxiety and pathological laughter. There was therefore partial support for Hypothesis 3, in that anxiety was associated with pathological crying and total scores for pathological emotionalism, but not pathological laughter.

Fifteen percent of participants in the study were classified as having emotionalism on the PLACS measure and 21.7% on the House measure. Although different rates were obtained from the two measures, the difference did not reach statistical significance. Hypothesis 4a was therefore not supported.

Forty-five percent of participants were identified as having depression on the HADS depression scale, compared to 20% on the HRSD, at the higher cutoff level. This was a statistically significant difference. Hypothesis 4b was therefore supported.

Differences in the relationship between emotionalism and depression were also found, related to which method was used to assess the conditions. Significant correlations were found using the HRSD and PLACS, but there were no significant correlations between emotionalism on any of the PLACS scales and depression as measured by the HADS-D. Hypothesis 4c was therefore supported.

Finally, participants' scores for emotionalism and depression were used to define groups showing the co-occurrence of emotionalism and depression in the sample. This
demonstrated graphically that emotionalism occurred both alone and in combination with depression in this study.

5.2 Interpretation of findings

Hypothesis 1: Separation of emotionalism and depression

Factor analysis of participants’ scores from the emotionalism and depression measures will extract two factors, corresponding to the two conditions.

As emotionalism and depression have been found to commonly co-occur in stroke patients, it is recognised that there may be difficulties in differentiating the two conditions in both clinical practice and research (Robinson et al. 1993; Brown et al. 1998). The first part of the study therefore concerned the question of whether depression and emotionalism can be conceptually separated using existing methods of measurement. The findings of this study suggest that the measures of emotionalism and depression do not confound the conditions and are measuring separate constructs.

This finding relates to a question that has been raised about the interpretation of results in antidepressant treatment trials of emotionalism. In these studies, it has been found that scores on measures of depression are higher in groups of participants with emotionalism than those without, and that these scores then fall with antidepressant treatment (see for example: Robinson et al. 1993; Brown et al. 1998; Burns, Russell, Stratton-Powell, Tyrell, O’Neill & Baldwin, 1999; Muller, Murai, Bauer-Wittmund & von Cramon, 1999). It was considered in this study that the interpretation of these
results may be complicated if emotionalism and depression were being confounded in measurement. This finding is evidence in support of the conclusion by Robinson et al. (1993), that the treatment effect on emotionalism is independent of treatment of depression. That is, these results suggest that the improvement of emotionalism seen with antidepressant treatment is independent of a concurrent improvement in depression. The results also support the conclusion that although emotionalism is associated with depression in a number of cases, it appears to be a condition that is independent of depression (Robinson, 1998). This also has implications for clinical practice, as the two conditions need to be differentiated in the clinical setting so that appropriate treatment for each can be considered. The clinical implications of this finding are discussed further below.

Hypothesis 2: Correlation between emotionalism and depression scores

2a: Participants’ scores for emotionalism and depression will be significantly positively correlated

2b: Depression scores will account for variance in emotionalism scores, after controlling for associations with non-psychological variables:

Emotionalism in stroke has been classically described as a disturbance of the motor concomitants of emotional expression (Wilson, 1924). As such, it has been thought to be a neurological condition, unrelated to psychological variables (Calvert et al. 1998). However, more recent research has found that stroke patients with emotionalism have higher rates of post-stroke depression (House et al. 1989; Andersen, 1995) and an
The aetiological link between emotionalism and depression has been proposed, in the serotonergic hypothesis (Andersen, 1997). The aim of this study was to extend the findings of previous research into the relationship between emotionalism and depression, by examining the strength and direction of the association between the two conditions. As serotonergic neurotransmission has been hypothesised to be disrupted in both conditions, it was predicted that the two conditions would be positively correlated.

Depression was found to be positively associated with pathological crying, but negatively associated with pathological laughter. There was no significant correlation between depression and total scores for pathological emotionalism with the crying and laughter subscales combined. Different results were therefore found from the subscales of the PLACS.

Emotionalism has also been found to be related to non-psychological variables in some studies and this relates to the question of whether such associations may be more important in explanatory models of emotionalism than its psychological correlates. It was therefore planned to control for potential confounding variables in the analysis. A second prediction was that depression scores would account for variance in emotionalism scores, after controlling for the contribution of other non-psychological variables found to be associated with the condition in the sample. This would then address the question of whether emotionalism may be considered a ‘psychologically empty’ phenomenon (Calvert et al. 1998), or whether psychological correlates may be important in the understanding of its aetiology (House et al. 1989).
No significant correlations were found between emotionalism and gender or lesion laterality, but both pathological crying scores and depression scores were found to be higher in younger participants. Partial correlations were therefore computed and depression scores were found to still account for variance in the emotionalism scores, after controlling for the association with age. This result supports previous opinion in the literature that psychological variables are important to an understanding of emotionalism (for example: Eccles et al. 1999; House et al. 1989; Calvert et al. 1998) and that neuro-behavioural theories do not appear to provide a complete account of the aetiology of the condition.

It was therefore observed in the present sample that pathological crying was associated with depression, above its association with non-psychological variables. Emotionalism and depression were also found to be separable by the measures used in the study, which indicates that this association is unlikely to be an artefact of measurement. This result therefore supports previous findings of an association between emotionalism and depression (House et al. 1989; Andersen, 1995) and extends these in the finding that the correlation between the two conditions was positive. As a prediction of a positive association was made from the serotonergic hypothesis (Andersen et al. 1997), the results here also lend support to the theory of there being an aetiological relationship between the two conditions. However, it may be cautioned that causation cannot be implied from correlational associations alone and although these findings are in agreement with the theory of an aetiological link, they could also be explained by depression being consequent to emotionalism. It may be for example, that depression could occur in some patients due to the additional burden of their having to cope with emotionalism as well as the other effects of stroke. However, it was clear that the
severity of both conditions increases together and the clinical implications of this are discussed further below.

Different findings were observed from the subscales of the PLACS, in that only pathological crying was found to have a positive relationship to depression scores, whereas pathological laughter was found to have a negative relationship to depression. This was an unexpected finding and alternative interpretations were therefore considered. For example, it is possible that the difference in results from the two subscales of the PLACS was due to an artefact of the laughter scale. Extreme scores from some participants were found to affect the distribution of this scale, causing it to have different properties to the crying scale and this may have had an effect on the results of the correlational analysis. However, the data from this scale were transformed to near normality prior to this analysis and even though complete resolution of the skew on the scale could not be achieved, a non-parametric test of correlation was used as a more conservative statistical method. The abnormal distribution of the scale should not therefore have produced results that were invalid. This would need to be clarified in further examination or development of the laughter scale before the difference in results observed here could be interpreted as a reliable finding. However, an alternative explanation could be that pathological laughter and pathological crying do have different relationships to depression. In support of this, it was observed from inspection of the raw data that pathological laughter in the sample here always occurred in participants who also had pathological crying. These participants thus had mixed emotionalism, affecting both laughter and crying, which resulted in them having high total scores of emotionalism. The suggestion could therefore be made that pathological laughter may be found in more severe presentations of emotionalism and this may
constitute a separate type of the disorder that has a different relationship to depression. This could be investigated further in future research and this is discussed further below.

The study also found that depression was not associated with overall pathological emotionalism as measured by the PLACS total scores. This finding was verified using a more powerful parametric test of correlation as an additional exploration and this adds support to the reliability of this non-significant result. A possible explanation for this finding is that the positive and negative correlations between depression and the two PLACS subscales may have combined to make the correlations with the total PLACS scale non-significant. In this case, there is the implication that the PLACS may be better analysed as separate scales in research, as the subscales are either performing differently as regards their psychometric properties or could be interpreted as measuring different types of emotional disorder. Therefore there may be value in treating them as separate scales, similarly to for example, the subscales of the HADS. This may also apply to the use of the PLACS in clinical settings, where separate scales for pathological crying and laughter would be useful in specifying the particular features and problems of emotional disorder in individual patients.

In correlations with non-psychological variables, pathological crying scores were not found to improve over time in this sample, as would have been predicted from previous research findings that emotionalism resolves over time after stroke (Allman, 1991). However, the improvement in emotionalism later after stroke may not be expected to be found in this data, as the study design was not longitudinal. Therefore, there was no within-subject data that may have shown the resolution of emotionalism, but only a cross-sectional sample. However, it may still have been expected that less emotionalism
would have been found in participants seen later after stroke in the study, as the
frequency and intensity of emotionalism symptoms tend to diminish over the first year,
concurrent with neurological recovery (ibid). A longitudinal design monitoring the
course of emotionalism over time would be required to demonstrate the exact
relationship between emotionalism and time since stroke, but the findings in this study
do indicate that the condition can still be a significant problem a long time after stroke.
Conversely to this, pathological laughter scores in this sample were found to increase
over time. Again, this demonstrates different findings from the laughter scale of the
PLACS that could be explained by the suggestion that pathological laughter is a distinct
disorder with different characteristics and correlates to pathological crying.
Alternatively, this finding may also be explained by an artefact of measurement created
by the PLACS laughter scale. For example, it may be possible to score for normal
laughter on the PLACS-L. This may result in a positive relationship between
pathological laughter and time, if it were the case that patients may laugh more later
after stroke, when they are more recovered and returned to their normal mood state. In
support of this explanation, inspection of the items of the PLACS-L scale suggests that
it may be possible for respondents to score up to five or six on the scale if reporting
normal laughter (Appendix C). Although this is a highly speculative suggestion, it again
indicates that refinement and further development of the PLACS-L is needed prior to a
replication of this analysis to ensure the reliability of findings. Alternatively, the
positive association with time since stroke could be related to pathological laughter
being characteristic of a more severe presentation of emotionalism that does not resolve
over time. Again, this possibility could be investigated in further research using
subgroups of emotionalism severity, and this is discussed below.
The final significant finding related to this hypothesis was that there was more pathological crying and depression in younger participants in the sample. In research into post-stroke depression, younger age has been found to be associated with a higher incidence of depression in some studies (for example; Burvill, Johnson, Jamrozik, Anderson & Stewart-Wynne, 1997). However, to the author’s knowledge, this finding has not been reported in previous emotionalism research and may warrant further investigation if replicated in future research and not found to be specific to this sample.

There was no significant correlation found between emotionalism and gender in this study and the association found in previous research between female patients and emotionalism (McGrath, 2000) was therefore not replicated here. However, it was useful to include this variable in the study, as there may be a cultural effect of crying following stroke being more prevalent in females, which was useful to exclude. Finally, there was no correlation found in the data between emotionalism and lesion laterality. However, although emotionalism has been found to be associated most frequently with bilateral stroke lesions, findings on this issue vary between studies and associations are found with lesions at various sites. In addition, the information on lesions location that was available for the present study was limited to laterality and this precluded more detailed analysis of lesion location.

**Hypothesis 3: Correlation between emotionalism and anxiety scores**

Participants’ scores for emotionalism and anxiety will be significantly positively correlated.
A potential association between emotionalism and anxiety in stroke has been suggested by a published study that found an association between emotionalism and a subscale for anxious preoccupation (Eccles et al. 1999) and a link has also been suggested between post-traumatic stress disorder (PTSD) and emotionalism (Calvert et al. 1998). However, this has not been investigated further in research to date and the secondary aim of this study was therefore to conduct a preliminary investigation of the relationship between anxiety and emotionalism. As involuntary emotional expressions are reported by patients to be distressing and embarrassing in social situations, it was predicted that emotionalism and anxiety would be positively correlated.

Anxiety was found to be associated with pathological crying and total scores for pathological emotionalism, but not pathological laughter. As above, this demonstrates different findings from the laughter scale of the PLACS that could be due to artifact or to pathological laughter being a distinct disorder having different characteristics and associations to those of pathological crying.

The association with anxiety was the most consistent finding in the correlational analysis, as it was found in relation to both the PLACS crying and total scales. It also had the largest effect size in the correlational analysis. This finding replicates the self-report of anxious preoccupation in stroke patients with emotionalism found by Eccles et al. (1999) and is also of interest in regard to the theory of a potential link between emotionalism and PTSD by Calvert et al (1998), as anxiety is also a feature of PTSD (Semi, Tarrier & O’Neill, 1998). However, as with the correlations with depression above, causation cannot be implied from this correlational data alone and anxiety may also occur in stroke patients as a consequence of emotionalism, rather than being
involved in its aetiology. There is less evidence in the literature to suggest an aetiological link between emotionalism and anxiety than there is for such a link in the case of depression. However, the finding here suggests that this does warrant further investigation. The positive association between the conditions also has clinical implications, which are discussed below, with potential directions for future research.

**Hypothesis 4: Effect of different methods of assessment of emotionalism and depression**

4a: Different rates of emotionalism will be obtained from different measures of this condition.

4b: Different rates of depression will be obtained from different measures of this condition.

4c: Different measures used to assess emotionalism and depression will affect the statistical associations between the conditions

Review of the emotionalism literature indicates that there is a lack of consensus about the defining criteria for the identification of the condition and differences in how emotionalism is conceptualised by separate researchers (Moore, Gresham, Bromberg, Kasarkis & Smith, 1997). This leads to differing methods of assessment for emotionalism being used in different studies (Muller, Murai, Bauer-Wittmund & von Cramon, 1999). and the possibility that different rates may be obtained from these. Different measures have also been used in emotionalism studies to assess depression and it was considered that these may also produce different rates, particularly as somatic bias can be a problem in stroke populations. Comparisons of the findings from two
measures of both emotionalism and depression were therefore used to test the hypothesis that different rates and associations of emotionalism and depression would be obtained from different measures of both conditions. Additionally, the process of developing specific scales for emotionalism in stroke remains at an early stage and there is little validation information on measures available at the moment. A further aim of the study was therefore to provide information on the psychometric properties of the emotionalism measures used.

In the comparison of the emotionalism measures, the study found that fewer participants in the sample were identified as having emotionalism as assessed by the PLACS than the House measure, but the difference in these rates was not significantly different. This indicates that although the two measures do differ on their items for the identification of emotionalism, they also have considerable similarity. This suggests that there is consensus about the definition of emotionalism from two measures that have been developed independently by different expert researchers. The similarities are demonstrated in that both the PLACS and House measures have items on voluntary control of emotional expression, embarrassment or distress, frequency and duration of episodes (Appendix C). However, it can be seen that the measures also differ in some criteria. For example, the House measure does not use 'inappropriateness' of expressed emotion as a criterion, as its authors wished to include the full spectrum of emotionality in their research studies (House et al. 1989). The PLACS differs in that it does use 'inappropriate stimuli' and dissociation between the expressed and subjectively experienced emotion as additional defining criteria (Feinstein, Feinstein, Gray & O'Connor, 1999). This may explain the lower rates obtained in this study from the PLACS, as these additional criteria are more stringent and may relate to a more severe
presentation of emotionalism that is less prevalent. Therefore there is some disagreement on the criteria to identify emotionalism between these measures and this may lead to different presentations of the condition being differentially classified by each of them. This lack of agreement about some criteria for emotionalism may also relate to the unresolved question in the literature of whether there are different types of the condition and this is discussed further below in implications for further research.

However, despite some differences in items and criteria between the two emotionalism measures used here, the lack of significant difference in their results suggests that they have considerable similarities and provides validation for their use in research and clinical assessment.

There were significant differences in the rates of depression obtained from the two depression measures in this study. This is a common finding, as different methods of depression assessment are known to produce widely differing rates of the disorder in stroke populations (Kneebone & Dunmore, 2000; Robinson, 1998; Lincoln et al. in press). The measures used here had different assessment criteria, in that the HRSD assesses a broad range of depressive symptoms including somatic items, whereas the HADS is designed to reduce somatic bias and provide a more unidimensional index of 'core' depression (Herrmann, 1997). A question in the study was therefore whether somatic bias in the HRSD would produce different rates that may affect the relationship between emotionalism and depression. The findings do not indicate that somatic bias inflated rates on the HRSD as the rates obtained were higher on the HADS-D. this finding is discussed further below in the summary of psychometric findings of the study measures.
Different associations between emotionalism and depression were obtained from the different measures used. Significant positive correlations were found between scores on the PLACS-C and HRSD, but not between scores on the PLACS-C and the HADS-D. However, the additional parametric test of correlation that was performed did find a positive correlation between pathological crying on the PLAS-C and depression on the HADS-D. This indicates that the association between emotionalism and depression was stronger when assessed with the HRSD, but there was a lesser association with emotionalism and depression scores from the HADS-D that was found with the more powerful statistical analysis.

Conversely, this difference in findings was also seen according to which measure was used to assess emotionalism, as scores from the House severity scale showed significant associations with depression from both the HRSD and the HADS-D. (This scale was included in the study to provide psychometric information for its use in comparison with the PLACS, as no validation data is available for it to date. These results were therefore not interpreted as part of the primary study aim). It was therefore concluded that the measures used to assess depression and emotionalism in this study did affect the examination of the association between emotionalism and depression and the choice of measures needs to be considered in future research in this area.

Finally in the analysis, participants scores for emotionalism and depression were used to define groups showing the co-occurrence of emotionalism and depression in the sample, using recommended cutoffs of the measures to provide categorical data. This descriptive data demonstrated graphically that emotionalism occurred both alone and in combination with depression in this study and provides support for the findings in
previous studies that depression is sometimes but not always associated with pathological emotionalism (Robinson, 1998). The proportion of participants classified as having emotionalism alone was very small in this study and precluded further analysis to examine potential differences in correlates in this subgroup. However, it may be useful in further research to examine these, as is discussed below in implications for further research. It may also be that the co-morbidity of depression and emotionalism affects the response of emotionalism to antidepressants. For example, in patients with co-morbid emotionalism and depression, the condition may respond either better or worse to antidepressant treatment (House, personal correspondence) and it may therefore be useful to examine the differential effects of this medication in the separate groups of patients as described here.

**Psychometric findings on measures**

Good inter-item correlations were found on all the depression measures. As well as having high internal consistency, the measures of depression were also highly correlated. These results would be expected, as the HADS and HRSD are both commonly used and well-validated measures, with extensive psychometric information available for them in the literature. Anxiety was also highly correlated with depression scores, again as is commonly found, although studies have demonstrated that the anxiety and depression subscales of the HADS produce separation of these constructs in factor analysis (Johnston, Pollard & Hennessey, 2000). This finding of multicollinearity can cause a potential problem in regression analyses, but did not interfere with the interpretation of results here, as the correlational analysis treats the data as independent (Tabachnick & Fidell, 1996). However, the choice of the HADS for the assessment of
both depression and anxiety may need to be reviewed in future research that did aim to employ a regression analysis.

All three scales of the PLACS and the House severity scale were also found to have high internal consistency suggesting that each is measuring unitary construct. The scales were also all highly correlated with each other, which would be expected if they were measuring the same construct. The House scale and the PLACS scale also perform similarly in the factor analysis, as scores from both fell onto a different factor to the depression scores. This supports the hypothesis that they are measuring the same construct. Finally, the rates obtained from the PLACS and House measure were not found to be significantly different, which suggests agreement between them on at least some of the criteria for emotionalism. These findings therefore provide further validation for the PLACS and preliminary data to suggest that the House scale is a useful assessment measure for emotionalism, although further psychometric evaluation of the severity scale is needed.

Findings from the PLACS-C and House severity scale were similar, both in their correlations with the other subscales of the PLACS and in their correlations to anxiety and depression. This therefore suggests that the House severity scale is measuring a construct similar to the PLACS-C, of pathological crying, but has less similarities to the PLACS-L as a measure of pathological laughter. These findings suggest that the House severity scale may be useful as an adjunct to the House interview with further validation, but would need to be combined with its criteria for the identification of emotionalism for use in clinical practice and further research. It can be seen from inspection of the items in the measure, that the focus is more on crying than
pathological laughter, although laughter is asked about in the interview and criteria (Appendix C). The wording of items in the measure could therefore be changed to include pathological laughter more specifically, giving an overall measure of severity that includes all aspects and criteria of emotionalism.

As discussed above, the laughter subscale of the PLACS had an abnormal distribution and different correlational findings from those of the crying subscale. There was also no correlation between the House severity scale and the PLACS laughter scale. This supports the findings as above that the laughter and crying subscales of the PLACS perform differently in their associations to the study variables. However as before, this does not give information as to whether this may be due to artefact of the scale or to pathological laughter being a distinct disorder and further refinement and validation of the scale is needed to answer this question.

5.3 Clinical implications

Sample

The prevalence of emotionalism found in the study sample was within the rates previously reported in the literature (House et al. 1989). This indicates that the condition is a significant problem in the stroke services involved in the study. As emotionalism is often a hidden problem not reported by patients, feedback of these results would be useful to increase staff awareness of the condition and alert them to the possibility of its occurrence amongst their patients. Emotionalism is recognised to be a major unmet need within stroke services, with patients rarely being referred for treatment (Andersen, 1997) and there is an important role for Clinical Psychology to raise this issue with
stroke care staff and feedback the results of studies such as this. The additional finding in this study that there was no significant correlation with time since stroke is also an indication that the condition can still be a significant problem a long time after stroke and staff in follow-up care and out-patients may therefore also be alerted that patients may present with the condition in these settings as well as during in patient care.

Relationship between emotionalism and depression

The findings here support the view that emotionalism and depression do occur as separable conditions (Robinson, 1998). This is also an indication for staff that of the need to be aware of emotionalism as a potential problem that is separate to depression, although the conditions can often co-occur. This finding supports the opinion that the presence of crying in patients after stroke is not necessarily an indication of depression, or an understandable reaction to stroke (Brown, Sloan & Pentland, 1998), but may be the disorder of emotionalism. In practice, it may be difficult to differentiate these possibilities informally in day-to-day care, when both staff and patients are busy with rehabilitation programmes. It is therefore important to assess each patient’s individual symptom profiles to determine how these combine and the problems each patient has. Discussion within services and the development of protocols specifying when it may be appropriate to refer patients on for further specialist treatment would also be useful for staff guidance and again, liaison with staff in the development of assessment procedures and protocols is an appropriate role for Clinical Psychologists in stroke services.

The presence of emotionalism and depression as separate disorders is also useful information to be given to patients and their families. It may be explained that patients experiencing emotionalism are not necessarily depressed and information about the two
conditions can be given separately. For example, it may be helpful to explain to patients that emotionalism is known to occur following stroke and that it usually resolves, although if it does continue, it may respond to treatment with antidepressant medication. An explanation to patients that episodes of involuntary emotionalism do not mean they are 'losing their mind' (as was commented by one participant in this study), or getting worse, may be reassuring. A useful analogy has also been suggested, about regaining control of emotional expression after stroke similarly to regaining physical function and this may also help patients to understand the disorder of emotionalism (Allman, 1992). However, it may also be pointed out that depression and emotionalism can occur together and both lead to increased crying. Patients and their families may therefore be warned that if crying more than previously, their mood may need to be assessed and they should alert staff rather than concealing the problem. A leaflet outlining these points about emotionalism and depression may be useful to have in wards and departments for patient information and the skills of a Clinical Psychologist are appropriate to be involved in the production of such a leaflet and assessment of its impact.

Where emotionalism occurs alone and in severe presentations of grossly abnormal emotional episodes, as was found in a small number of participants in this study, Clinical Psychologists may consider developing or adapting specific treatments. For example, although there is very little literature on this at the moment, one study was identified that reported on the treatment of emotionalism with behaviour therapy (Brookshire, 1970). However, this intervention concerned a person with multiple sclerosis and it would need to be examined whether the intervention would transfer to treatment in stroke.
As well as indication that emotionalism and depression occur as separate conditions, the study also found evidence of a relationship between the two conditions. This supports the hypothesis of an aetiological relationship between the conditions, via serotonergic neurotransmission (Andersen, 1995). It also supports the view in the literature that it may be useful to consider psychological models of emotionalism, rather than defining the condition as psychologically meaningless (Calvert et al. 1998). Such models may then contribute towards treatment and management of the condition and again could be developed by Clinical Psychologists.

For example, as in previous studies, this study again found that emotionalism rarely occurred in the absence of emotionally meaningful stimuli (House et al. 1989; Allman, 1992). Participants reported experiencing episodes of emotionalism in response to negative thoughts about such things as their stroke and disability and several reported particularly having episodes when visited by relatives. This suggests that supportive interventions could be developed for inpatient care, which may help to reduce the incidence or impact of emotionalism episodes in patients suffering with the condition. For example, privacy for patients to receive visitors could be arranged, so that patients do not have to worry about experiencing emotionalism in front of other people on the ward. One participant in the study commented that they were concerned about this to an extent that they asked their family not to visit. Such situations need to be avoided, to ensure that patients do not lose support and morale from contact with their families in the stroke recovery period. It may also be possible to consider ways in which levels of emotional stimulation could be controlled (House et al. 1989), for example by reducing patients’ exposure to external events that they may find difficult such as conversations
about illness with other people on wards, or by them being taught to monitor their cognitions and reduce negative thoughts.

This last point also links to more specifically psychological treatment of emotionalism. It may be that psychological treatment of depression may be appropriate for those patients in whom emotionalism and depression co-occur, but their association may need to be taken into account in consideration of adaptations to this treatment. For example, it was found in this study that there was a positive correlation between emotionalism and depression scores and the clinical implication of this is that the severity of the two conditions increases together. This then suggests that the co-occurrence of the conditions may be associated with greater severity of symptoms of each and they may have an incremental effect on one another. For example, emotionalism may worsen depression, as it presents another problem to cope with in addition to the other effects of stroke. It may also lead to isolation if sufferers avoid people due to social embarrassment about lack of emotional control, which may also worsen depression. As above, negative cognitions in depression may also trigger episodes of emotionalism, which may then be interpreted by patients as an indication that they are more depressed, so creating hopelessness and reinforcing depression in a feedback ‘loop’. Cognitive-behavioural therapy for post-stroke depression may therefore need to be adapted to address cognitions about crying and negative interpretations of this.

*The relationship between emotionalism and anxiety*

The positive association between emotionalism and anxiety was a new finding and the strongest result in the study. However as discussed above, causation cannot be implied
from this result. Anxiety may be interpreted as a consequence of emotionalism, for example if patients experience anxiety about crying in social situations. This may then fit with a reinforcement model of anxiety, if avoidance of social situations then increases the problem (Hawton, Salkovskis, Kirk & Clark, 1989) and this may warrant further investigation. Alternatively, there could be an aetiological link between the conditions, with anxiety being experienced as part of a trauma model of stroke, as suggested by Calvert et al. (1998). The implications for patient care are that, if considered a consequence of emotionalism, the association with anxiety demonstrates the impact of the condition for patients and the distress that it can potentially cause. This is important to feedback for staff awareness.

In addition, as with depression above, supportive and treatment interventions may be instigated during in patient care to reduce anxiety where it is associated with episodes of emotionalism. For example, anxiety may be experienced in relation to crying in certain emotionally charged situations such as receiving visitors or telephone calls from family, as was reported in comments from participants in this study. Staff therefore need to be aware of this possibility and intervene appropriately. In this example, it would be helpful to encourage patients to continue receiving visitors, as this provides support for them and prevents the reinforcement of anxiety through avoidance. However, they may need support from staff to be able to do this such as open discussion with them and their visitors about the problem and behavioural rehearsal if necessary (Clark, 1989)

Information about the study measures

As the emotionalism measures used in the study were found to differentiate emotionalism from depression, both can be recommended to staff for use in identifying
the condition in clinical practice. In addition, the PLACS in particular may be useful for monitoring the course of the condition and assessing the response to treatment, as it provides a measure of severity. However, as discussed, there were differences in findings from the subscales of this instrument and these may be most appropriate if used to assess pathological laughter and crying separately. This would then assist the assessment of emotionalism symptoms in individual patients' presentations and give more detailed information about the particular problems that emotionalism causes them. It would therefore be good practice for a measure of emotionalism to be used routinely in screening for the condition in stroke services, to identify the condition as it arises and increase both patients' and staff awareness about the disorder.

Conversely, the HADS and HRSD also both produced scores that were statistically separable from emotionalism scores and these can therefore also be recommended for screening in practice, as they do not confound depression and emotionalism. The HRSD and HADS were used primarily in the study for the examination of the relationship between emotionalism and depression in theoretical terms, but there was no evidence here to suggest that either performs poorly in differentiating emotionalism. Therefore, either could be used for screening for depression in this context. However, the HRSD does require its user to have some training or familiarity with depression and it may be most appropriate if used as a secondary assessment tool after referral for consideration of treatment for depression. In this case, the HADS may be more useful as an initial screening measure as it is also relatively brief compared to the HRSD. As above, the choice of depression assessment methods depends on the aims of the assessment in context.
5.4 Methodological limitations

Sample

Two populations were used in the study to maximise the sample size, so that sufficient numbers of participants were seen to conduct the analyses and answer the study questions. This was important for this research, as emotionalism is a relatively rare disorder, but may have created bias in the analysis from extraneous variables. Analyses were therefore conducted to determine whether there were any differences in mean depression or emotionalism scores from subgroups in the sample and the samples were then combined. However, the sample size obtained was still relatively small, due in part, to the limited resources of the study and this limited the choice of statistical analysis that could be done. For example, the factor analysis in the study was conducted at scale level and not item level. An additional regression analysis could also have been performed, including all psychological and non-psychological variables in the study to develop a predictive model of emotionalism. A power analysis indicated that the sample size in the study was sufficient to avoid a type II error in the correlational analysis used (Clark-Carter, 1997) and significant results were found.

As an opportunity sample was used rather than consecutive admissions after stroke as would have been preferable, there may have been selectivity in the sample that reduced its representativeness. Unfortunately, there was no local data with which to compare the sample as there was no active stroke register in the area. However, the participants in the sample were representative of stroke patients generally as regards type of stroke (Feigin, Lawes, Bennett & Anderson, 2003), with 76.7% of participants in the sample having ischaemic stroke and 16.7% having haemorrhagic stroke. Participants also had a range of disability as estimated from available scores on the Barthel Index. There were
more males in the sample, but it was thought that this should not have affected the analysis as the statistical test used accounted for this inequality in rates.

For a correlational analysis, a range of scores on the variables being assessed are needed (Tabachnick & Fidell, 1996). Participants in the sample had a wide age range and were seen at varying time since stroke, therefore giving sufficient range on these variables to explore them in the correlational analysis. There was also sufficient range in scores from each of the study measures for this analysis, as shown in Table 1 (page 52).

The rates of depression obtained in the study were representative of those usually reported in stroke populations (Kneebone & Dunmore, 2000). Anxiety rates were higher than those reported for a classification of Generalized Anxiety Disorder in stroke patients (Robinson, 1998). However, this would be expected as self-report information from the HADS anxiety scale was used and is known to produce higher rates than diagnostic assessment schedules (Silverstone, 1994: Aben, Verhey, Lousberg, Lodder & Honig, 2002). Again, a range of scores was important from this measure and was sufficient for the analysis. The rates of emotionalism obtained were also within the range previously reported in stroke patients (House et al. 1989). These findings suggest that the sample obtained in the study was representative of stroke study samples in the literature, on the relevant psychological variables of depression and emotionalism, although rates of anxiety were higher.

Statistical methods used

As discussed, there were problems with the parametric assumptions of normality on the PLACs laughter subscale. The data from this scale were transformed and improved but
the skew could not be completely resolved. A non-parametric test of correlation was therefore used. The non-significant results of this were verified with a parametric version of the test. However, this more powerful test did find a significant result on the relationship between emotionalism and depression as assessed by the HADS, as well as by the HRSD. This significant correlation was not found with the non-parametric test. Therefore, the statistical method used in this one instance did affect the results and it may be useful to replicate this analysis after refinement of the PLACS laughter scale.

As above, it was considered that an additional regression analysis could also have been performed to explore a model of the complex variables suggested to be involved in the aetiology of emotionalism in previous research. However again, the PLACS laughter scale would need to be refined before this and a larger sample would be needed (Clark-Carter, 1997).

Method

The study found support for the importance of psychological variables in an understanding of emotionalism, above its relationship to non-psychological correlates found in previous research. However, not all potential non-psychological variables were included here. A formal assessment of disability and cognitive status could also have been made and included in the correlational analysis. However, this would have increased the time to administer the questionnaires considerably and this would not have been acceptable for stroke patients, some of whom were still in the relatively early stages of recovery. The data from the CT scan reports in participants' medical notes was also too imprecise to give an accurate indication of lesion location for examination of this in relation to emotionalism scores. However, this would be a suggestion for further
research in this area, in collaboration with a Radiologist to provide detailed lesion assessment.

The cross-sectional design used here meant that there was no control over how many participants had been treated with antidepressant medication or had resolved emotionalism that was not identified in the study. A prospective study following the course of emotionalism in relation to depression would be an appropriate design to assess this and this is also a suggestion for further research.

The administration method of the study questionnaires was partially determined by stipulation from the Ethics Committee that the researcher should be present to help participants complete these. Ratings may have been affected by observer bias or the researcher being aware of answers to previous questionnaires. Every effort was made to reduce this, as discussed in the procedure section, such as consideration of the order of presentation of the questionnaires, standardization of the HRSD as much as possible by using a more structured version of the scale together with specific probes and scoring of the measures after participants were seen, to avoid knowledge of scores during interviews. This method did have advantages in that it avoided the response bias and problem of missing data found in postal or self-completion questionnaire designs. The method also followed that used in previous emotionalism studies by Allman, (1991) and House et al, (1989). However, it was a limitation in the study. Therefore, it would be preferable in future studies to employ additional researchers, so that independent ratings of emotionalism and depression could be made. This would increase the reliability of the assessments, although there can still be a problem to a certain extent in this particular area of research, as both emotionalism and depression can be observed in the
presentation of participants, without specific questioning about symptoms. For example, an episode of emotionalism can occur during assessment, or in the case of depression, non-verbal signs of the condition can be seen.

*Measures*

In retrospect, the choice of the HADS may have been less useful for the statistical assessment of the association between emotionalism, depression and anxiety in this study, due to the high correlations between its anxiety and depression subscales. This multicollinearity can create problems in regression analysis (Tabachnick & Fidell, 1996), which may have been an additional option in the study. Therefore it may be best to use a separate anxiety scale. However, this would have increased the length of the interview in this study, which may have been less acceptable for the participants.

The use of both the HRSD and HADS measures gave additional information in the study, from their comparison in the correlational analysis. However, this made the interpretation of results complex, as it introduced a number of different factors and potential confounds that would require further investigation, such as the non-significant result from the association between emotionalism and depression as measured by the HADS and PLACS in the non-parametric analysis. The inclusion of four measures did provide additional information in the study about their use in such research and generated suggestions about the choice of measures in future investigations of this type. For example, the HRSD may be considered more useful in research into emotionalism, as it has been used most commonly in previous studies and results can therefore be compared between studies or in meta analysis. This is particularly useful in
emotionalism research, as the condition is relatively rare. There was no strong evidence here to suggest that the HRSD performs more poorly in assessing depression in relation to emotionalism than the HADS, as there was no suggestion that somatic bias inflated the rates of depression it identified. The HRSD also uses an observer rating, so overcomes the potential problem of selectivity in samples due to stroke patients having difficulty with self-report measures and therefore being excluded from samples. Therefore the HRSD was considered an acceptable choice of measure for this study. Differences in rates of depression were found from the two measures, which suggests that the measures used does affect results in this area of research. It may therefore be best to standardize measures between studies where possible.

5.5 Implications for further research

Anxiety

Further research on the association between emotionalism and anxiety observed in this study could also be suggested. It was found that anxiety was associated with both pathological laughter and total scores for pathological emotionalism on the PLACS. However, as discussed, causation cannot be implied from this correlational data and anxiety could either be consequent to emotionalism, or involved in its aetiology. The possibility of anxiety being a consequence of emotionalism is suggested by participants’ comments in the study that they experienced embarrassment and distress in social situations due to the condition. This may result in anxiety in these circumstances that is then reinforced by avoidance. Alternatively, anxiety may be involved in the aetiology of emotionalism as part of a trauma or PTSD reaction to stroke, as discussed above.
(Calvert et al. 1998). Both of these possibilities suggest the need for further investigation. Suggestions for this are that stroke patients with emotionalism could firstly be interviewed about their experiences of anxiety, to ascertain its characteristics, antecedents and reinforcers. A further investigation could also be conducted to assess the type of anxiety being reported by stroke patients with emotionalism, using diagnostic schedules to classify whether this is, for example, phobic or generalized.

*Further development of the emotionalism measures*

From the use of the emotionalism measures in this study, suggestions can be made for their development. As discussed above, the criteria to define emotionalism need to be standardised so that one measure is developed that reliably assesses the condition with reference to all the relevant criteria. For example, warning that an episode of emotionalism is about to happen is considered to be an important defining characteristic of emotionalism (Shaibani, 1994). The House interview uses warning as a criterion, whereas the PLACS does not and this may lead to differences in the incidence of emotionalism that are identified by the two measures. The House measure also stipulates that a change in emotional behaviour is necessary for a classification of emotionalism and it is a potential weakness in the PLACS that it does not and it may therefore be possible to score for normal emotions on items one and two on this scale (Appendix C). However, in order to standardise the criteria, there would need to be agreement on these between researchers in the area. Experts in the field could therefore be asked for their opinions to draw up a suggested list of criteria that could then be piloted for validation and subject to full psychometric evaluation. In order to be useful
for monitoring the course of emotionalism, such a measure should also give an index of severity of the condition, from mild to severe presentations.

Cut-offs for the classification of pathological emotionalism could also be established and the measure would need to be validated comprehensively. This could be achieved by piloting in other populations to establish its performance, for example using a sample of people post MI, another medical sample such as dermatology patients, a sample of participants with clinical depression and a general population, to ensure the measure does assess pathological emotionalism differentially in these populations.

The PLACS laughter scale

As discussed above, Different findings were observed from the subscales of the PLACS in relation to depression, anxiety and time since stroke. As the PLACS-L had a non-normal distribution, there is the possibility that these findings were due to an artifact of the scale and it therefore needs to be refined and the analysis replicated. In particular, the potential for scoring for normal laughter would need to be excluded from the scale and the reason for the production of outliers that affected the distribution would need to be ascertained. There was also the question raised from the use of the scale in this study, whether its results could be explained by pathological laughter having different characteristics to pathological crying. If this finding were replicated after refinement of the scale, then this may have implications for the question of whether the different presentations of emotionalism are distinguishable types of the disorder. In this case, it may be that the presence of pathological laughter represents a different type of emotional disorder to that in which only pathological crying is observed.
Subtypes of emotionalism

If the finding that pathological laughter and crying do have different relationships to depression were replicated after refinement of the PLACS, the suggestion could be made that pathological laughter may be found in more severe presentations of emotionalism, constituting a separate type of the disorder that has a different relationship to depression. This could be investigated further in future research, by separating participants into two groups of more severe and milder forms of emotionalism, according to their scores on the PLACS. The respective relationships to depression and other clinical correlates in these two groups could then be investigated. For such further research, it could be investigated whether potential subtypes of emotionalism may be distinguished by their relationships to both depression and lesion location, separately and in combination. For example, more severe emotionalism may be less congruent with mood and this could be investigated by a replication of the present study, additionally comparing the association between emotionalism and depression in the two subgroups defined by the severity of emotionalism scores.

Additionally, the association between emotionalism and a combination of depression and lesion size / location could be examined in a regression analysis to determine a model of prediction that would assess the additive effect of these factors on emotionalism scores. This would examine the proposal in the literature of whether emotionalism may be due to a combination of neurological and psychiatric factors in some cases. This theory was proposed by Ross & Stewart (1987), who found the occurrence of emotionalism in two patients with unilateral, frontal stroke lesions. Lesions of this type would not usually be expected to be associated with emotionalism. As these patients were known to have pre-existing depression, it was suggested by the
authors that in some patients, the combination of a unilateral lesion and depression is necessary to produce emotionalism. A much larger sample size would potentially be required for this analysis, as severe emotionalism is known to occur much more rarely than the milder presentations (House et al. 1989, Allman, 1992)

5.6 Conclusions

The results of this study suggest that the measures of emotionalism and depression did not confound the conditions and were measuring separate constructs. This supports the view of emotionalism and depression as separate disorders, that commonly co-occur. The clinical implications of this finding are that staff in stroke care services need to be aware of emotionalism as a separate disorder to depression and specific advice and interventions are needed for each condition. It is also important to assess the condition accurately in clinical practice for referral and treatment decisions. As the measures used here do not appear to be confound emotionalism and depression, these are suggested to be useful for screening.

Both depression and anxiety were found to be positively correlated with emotionalism in this sample. These findings support the opinion that psychological variables are important to an understanding of emotionalism, both in relation to its aetiology and for the development of psychological interventions. Clinical implications of the findings and directions for further research are therefore discussed.

As predicted, different findings on the associations between emotionalism, depression and anxiety were obtained according to the measures used to assess each condition. It
was therefore concluded that the choice of measures does affect results in this area of research and it may be useful to the interpretation of findings to standardise these between studies where possible.

Additional psychometric information of the emotionalism measures was gained from their use in the study, giving indications for further refinement of these. It was concluded that these are effective but would benefit from further development and comprehensive psychometric evaluation.

It is also concluded that the skills of the Clinical Psychologist are applicable to all the aspects of emotionalism discussed in this study: research skills in further psychometric evaluation of emotionalism measures and in investigation of psychological correlates and models of the disorder; development and adaptation of psychological treatments for emotionalism, both where this occurs alone and in combination with depression; liaison with other disciplines in development of supportive interventions for in patients with the condition and initiatives to provide information for patients and their carers; and involvement in planning of stroke services to ensure routine screening for the disorder and referral for specialist treatment where appropriate.

As well as these specific interventions, a psychological approach to the problem of emotionalism is also valuable in its attention to psychological reactions to the devastating effects of stroke and how these may interact with a disorder of emotional expression. It is important to promote awareness of this aspect of emotionalism amongst patients and staff involved in their care. Finally, the condition is also of theoretical interest regarding the mechanisms of emotional expression and how these may be
affected in both depression and stroke. This is therefore an interesting theoretical issue
within the broader area of the neuropsychology of emotional expression, its function
and relation to affect.
Appendix A

Research Ethics Committee Approval Letter
13 May 2002

Please quote ethics ref no 6583
Ms Sally Damms
Trainee Clinical Psychologist
Centre for Applied Psychology (Clinical Section)
Ken Edwards Building
University of Leicester
University Road
Leicester LED1 7RH

Dear Ms Damms

Investigation into factors influencing the diagnosis of 'emotionalism' following stroke – our ref no 6583

Thank you for your helpful response dated 23 March 2002 forwarded to me by Alison Cooper, Research & Development Manager (Primary Care). Final approval is now given.

I would be grateful if you could let me have a copy of the amended Patient Information Leaflet and consent form for our records.

I am pleased to note that the Researcher will administer the questionnaire to the participants.

Yours sincerely

P G Rabey
Chairman
Leicestershire Research Ethics Committee
(Signed under delegated authority)

(NB All Communications relating to Leicestershire Research Ethics Committee must be sent to the Committee Secretariat at Leicestershire, Northamptonshire and Rutland Health Authority. If however, your original application was submitted through a Trust Research & Development Office, then any response or further correspondence must be submitted in the same way)
Appendix B

Patient Information Sheet
PATIENT INFORMATION LEAFLET

A study is being undertaken at Leicester Royal Infirmary / Leicester General Hospital / Coalville Community Hospital, into how people’s emotions may be affected after they have suffered a stroke. This letter is to tell you about the study and invite you to take part if you wish.

Title of study: ‘Emotionalism after stroke’

Name of principle investigator: Sally Damms, Trainee Clinical Psychologist

You may contact Sally Damms at: The University of Leicester, University Road, Leicester, LE1 7RH. Tel: 0116 2522162

This study is sponsored by: The University of Leicester

1. **What is the purpose of the study?**

The study is investigating why some people may find that their emotions are affected after they have suffered a stroke. It is hoped that this will give more information to stroke sufferers, their carers and hospital staff, about how to manage these emotional problems.

2. **What will be involved if I take part in the study?**

Taking part in the study would involve you being seen by the researcher to answer a set of questions. The questions would include whether you have had any problems with your emotions and how you are feeling generally. The researcher would only need to see you once, either in the out patients clinic when you attend to see your Consultant as usual, or whilst you are on the ward.
3. **Will information obtained in the study be confidential?**

The answers that you give to the questions asked will be treated confidentially. They will be recorded in compliance with the Data Protection Act, the same as with your other hospital records.

The study will later be written up and submitted to the University of Leicester, but no names will be used. It will not be possible to identify you in any documents relating to the study.

Your stroke Consultant at Leicester Royal Infirmary/Leicester General Hospital is already aware of the study and normally, your GP will also be informed that you are taking part.

4. **What if I am harmed by the study?**

Medical research is covered for mishaps in the same way as for patients undergoing treatment in the NHS i.e. compensation is only available if negligence occurs.

5. **What happens if I do not wish to participate in this study or wish to withdraw from the study?**

If you do not wish to participate in this study or if you wish to withdraw from the study at any time, you may do so without justifying your decision and your future treatment will not be affected in any way.

6. **Do I need to do anything now?**

You do not need to do anything now. The researcher (Sally Damms) will be in Dr. Ardon’s/Dr. Robinson’s out patient clinic when you next attend*/will visit the ward in the next two weeks* *(To be deleted as appropriate)* and may ask if you wish to take part in the study. You are entirely free to decide whether or not to take part. Please feel free to discuss this with your relatives if you wish. Thank you.

*(Patient Information Leaflet version 2, 29th May 2002).*
Appendix C

Study Questionnaires
Interview Schedule

Participant study no:

Consent form signed: Y / N date:

Date participant seen to administer questionnaires

Participant seen in........................Clinic / on........................Ward

Age:

Sex: M / F

First language:

Language difficulties (specify)..........................................................

Date of stroke:

Information on stroke lesion from neuro-imaging report or medical records:

.........................................................................................................

.........................................................................................................
The Pathological Laughter and Crying Scale

1. Have you recently experienced sudden episodes of laughter?
   Rate the frequency of the episodes during the past two weeks.
   0. Rarely or not at all
   1. Occasionally
   2. Quite often
   3. Frequently

2. Have you recently experienced sudden episodes of crying?
   Rate the frequency of the episodes during the past two weeks.
   0. Rarely or not at all
   1. Occasionally
   2. Quite often
   3. Frequently

If you have experienced sudden episodes of laughter, please answer the following (questions 3-10), otherwise skip to question 11.

3. Have these episodes occurred without any cause in your surroundings?
   Rate the frequency with which the episodes have occurred without external stimuli in the past two weeks.
   0. Rarely or not at all
   1. Occasionally
   2. Quite often
   3. Frequently

4. Have these episodes lasted for a long period of time?
   Rate the average duration of the episodes during the past two weeks.
   0. Very brief
   1. A few seconds
   2. Moderate (less than 30 seconds)
   3. Prolonged (more than 30 seconds)

5. Have these episodes been uncontrollable by you?
   Rate the ability to control the episodes during the past two weeks.
   0. Rarely or not at all
   1. Occasionally
   2. Quite often
   3. Frequently

6. Have these episodes occurred in the absence of feelings of happiness?
   Rate the frequency with which the episodes have occurred as a result of happiness in the past two weeks.
   0. Rarely or not at all
   1. Occasionally
   2. Quite often
   3. Frequently

7. Have these episodes occurred in excess of feelings of happiness?
   Rate the frequency with which the episodes have been disproportionate to the emotional state in the past two weeks.
   0. Rarely or not at all
   1. Occasionally
   2. Quite often
   3. Frequently

8. Have these episodes of laughter occurred with feelings of sadness?
   Rate the frequency of association between the episodes and the paradoxical emotion in the past two weeks. The sadness must precede or accompany the episode and not be a reaction to it.
   0. Rarely or not at all
   1. Occasionally
   2. Quite often
   3. Frequently

9. Have these episodes occurred with any emotions other than happiness or sadness, such as nervousness, anger, fear, etc.?
   Rate the frequency of association between the episodes and emotions in the past two weeks. The emotions must precede or accompany the episode and not be a reaction to it.
   0. Rarely or not at all
   1. Occasionally
   2. Quite often
   3. Frequently

10. Have these episodes caused you any distress or social embarrassment?
    Rate the degree of distress or embarrassment caused by the episodes in the past two weeks.
    0. Rarely or not at all
    1. Occasionally
    2. Quite often
    3. Frequently
If you have experienced sudden episodes of crying, please answer the following (questions 11-18).

11. Have these episodes occurred without any cause in your surroundings?
Rate the frequency with which the episodes have occurred without external stimuli in the past two weeks.
0. Rarely or not at all
1. Occasionally
2. Quite often
3. Frequently

12. Have these episodes lasted for a long period of time?
Rate the average duration of the episodes during the past two weeks.
0. Very brief
1. A few seconds
2. Moderate (less than 30 seconds)
3. Prolonged (more than 30 seconds)

13. Have these episodes been uncontrollable by you?
Rate the ability to control the episodes during the past two weeks.
0. Rarely or not at all
1. Occasionally
2. Quite often
3. Frequently

14. Have these episodes occurred in the absence of feelings of sadness?
Rate the frequency with which the episodes have occurred as a result of sadness in the past two weeks. The sadness must precede or accompany the episode and not be a reaction to it.
0. Rarely or not at all
1. Occasionally
2. Quite often
3. Frequently

15. Have these episodes occurred in excess of feelings of sadness?
Rate the frequency with which the episodes have been disproportionate to the emotional state in the past two weeks.
0. Rarely or not at all
1. Occasionally
2. Quite often
3. Frequently

16. Have these episodes of crying occurred with feelings of happiness?
Rate the frequency of association between the episodes and the paradoxical emotion in the past two weeks. The happiness must precede or accompany the episode and not be a reaction to it.
0. Rarely or not at all
1. Occasionally
2. Quite often
3. Frequently

17. Have these episodes occurred with any emotions other than happiness or sadness, such as nervousness, anger, fear, etc.?
Rate the frequency of association between the episodes and emotions in the past two weeks. The emotions must precede or accompany the episode and not be a reaction to it.
0. Rarely or not at all
1. Occasionally
2. Quite often
3. Frequently

18. Have these episodes caused you any distress or social embarrassment?
Rate the degree of distress or embarrassment caused by the episodes in the past two weeks.
0. Rarely or not at all
1. Occasionally
2. Quite often
3. Frequently
Emotionalism after stroke: an exploratory study of provocations. University of

1. Many people notice that after a stroke, they find it more difficult to control their
   emotions than they used to. Have you had that trouble?
2. Have you found that you cry more easily than you used to?
   Were you always an emotional person?
3. Do you actually cry, or just feel like it? (Patient must cry, not just feel like it)
4. Have you cried in public or in front of people where you normally wouldn’t have
done? Note situations in which patient has cried in clearly different circumstances
from pre-morbid behaviour
5. Do you get any warning before you start crying? If so, how much warning? Is
   there time to anything such as try to control yourself or leave the situation?
6. Once you start crying, can you bring it under control?
7. How long does a typical crying spell last?
8. Can you cry quietly, so that no one might notice?
9. What sort of things make you cry?
10. Do you ever cry and don’t know what has started you off?
11. How do you feel when you cry? What about immediately before and afterwards?
12. How often have you cried in the past week? What about today, yesterday, etc?
13. (If patient cries during interview) Is how I have seen you today typical of how you
   have been? Are you more tearful because I am asking you about it? (Note patient’s
crying behaviour, noisy, stereotyped etc.)
14. Have you noticed any other emotional changes, for example that you laugh more
easily than you used to?

Defining characteristics of emotionalism are:
1. changed emotional behaviour with increased crying (or laughing)
2. episodes which are to some extent out of voluntary control, so that they occur in
   situations where the patient would not have cried before
3. episodes come with little or no warning, not occurring in the context of sustained
   abnormal feelings

<table>
<thead>
<tr>
<th>Frequency</th>
<th>c. Disruptiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Able to hide</td>
</tr>
<tr>
<td>Rare (1, 2 or 3 times a week)</td>
<td>Obvious but not embarrassing or socially awkward</td>
</tr>
<tr>
<td>Infrequent (4, 5 or 6 times a week)</td>
<td>Socially awkward in its setting/situation</td>
</tr>
<tr>
<td>Occasional (average of once a day)</td>
<td>Striking social intrusiveness</td>
</tr>
<tr>
<td>Frequent (several times a day)</td>
<td>Presence of tears in eyes</td>
</tr>
<tr>
<td>Very frequent (dozens of times a day)</td>
<td>Normal crying</td>
</tr>
</tbody>
</table>

Severity
a. Frequency (as before)
<table>
<thead>
<tr>
<th>Severity</th>
<th>a. Frequency</th>
<th>b. Duration</th>
<th>c. Disruptiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 60 secs.</td>
<td>1</td>
<td>Total score: Mild</td>
<td>1-4</td>
</tr>
<tr>
<td>1-5 mins.</td>
<td>2</td>
<td>Moderate</td>
<td>5-8</td>
</tr>
<tr>
<td>5-10 mins.</td>
<td>3</td>
<td>Severe</td>
<td>9-12</td>
</tr>
<tr>
<td>Over 10 mins.</td>
<td>4</td>
<td>Very Severe</td>
<td>13 or above</td>
</tr>
</tbody>
</table>
Appendix D

Patient Consent Form
PATIENT CONSENT FORM

Title of Study: "Emotionalism after stroke"

Principal Investigator: Sally Damms, Trainee Clinical Psychologist

(This form should be read in conjunction with the Patient Information Leaflet, version no. 2, dated 29th May 2002).

I agree to take part in the above study as described in the Patient Information Sheet.

I understand that I may withdraw from the study at any time without justifying my decision and without affecting my normal care and medical management.

I understand that members of the research team may wish to view relevant sections of my medical records, but that all the information will be treated as confidential.

I understand medical research is covered for mishaps in the same way as for patients undergoing treatment in the NHS i.e. compensation is only available if negligence occurs.

I have read the patient information leaflet on the above study and have had the opportunity to discuss the details with Sally Damms and ask any questions. The nature and the purpose of the questionnaires to be undertaken have been explained to me and I understand what will be required if I take part in the study.

Signature of patient .........................................................Date.....................................

Name (in BLOCK letters).............................................................................................

I confirm I have explained the nature of the Trial, as detailed in the Patient Information Sheet, in terms which in my judgement are suited to the understanding of the patient.

Signature of Investigator .................................................Date.....................................

Name (in BLOCK letters).............................................................................................
Appendix E

Additional Results of the Study Analyses
4.2 Analysis of differences between the subgroups in the study sample:  
Additional data

In-patients and out-patients

Table 1: Mean scores on the study measures for in-patients and out-patients. (Study measures labeled as: The Hospital Anxiety and Depression Scale: anxiety subscale (HADS-A), The Hospital Anxiety and Depression Scale: depression subscale (HADS-D), Hamilton Rating Scale for Depression (HRSD), Pathological Laughter and Crying Scale: total score (PLACS-T)

<table>
<thead>
<tr>
<th>Source</th>
<th>HADS-D</th>
<th>HADS-A</th>
<th>HRSD</th>
<th>PLACS-T</th>
<th>House</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-patients</td>
<td>6.9</td>
<td>6.7</td>
<td>10.1</td>
<td>4.5</td>
<td>3.2</td>
</tr>
<tr>
<td>Out-patients</td>
<td>7.4</td>
<td>7.3</td>
<td>12.1</td>
<td>7.7</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Language subgroup analysis:

Table 2: Observed and expected frequencies of depression (HADS-D) in participants whose first language was, or was not English.

<table>
<thead>
<tr>
<th>First language English</th>
<th>Expected</th>
<th>Depression</th>
<th>Row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>29.7</td>
<td>24.3</td>
<td>54</td>
</tr>
<tr>
<td>Observed</td>
<td>29</td>
<td>25</td>
<td>54</td>
</tr>
<tr>
<td>First language non English</td>
<td>Expected</td>
<td>3.3</td>
<td>2.7</td>
</tr>
<tr>
<td>Observed</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Column totals</td>
<td>33</td>
<td>27</td>
<td>60 (Grand total)</td>
</tr>
</tbody>
</table>

(Pearson’s chi-squared $\chi^2 = 0.367$, df = 1, p = 0.681, non-significant).

Table 3: Observed and expected frequencies of anxiety in participants whose first language was, or was not English.

<table>
<thead>
<tr>
<th>First language English</th>
<th>Expected</th>
<th>Anxiety</th>
<th>Row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>31.5</td>
<td>22.5</td>
<td>54</td>
</tr>
<tr>
<td>Observed</td>
<td>30</td>
<td>24</td>
<td>54</td>
</tr>
<tr>
<td>First language non English</td>
<td>Expected</td>
<td>3.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Observed</td>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Column totals</td>
<td>35</td>
<td>25</td>
<td>60 (Grand total)</td>
</tr>
</tbody>
</table>

(Pearson’s chi-squared $\chi^2 = 1.714$, df = 1, p = 0.386, non-significant).
Table 4: Observed and expected frequencies of depression (HRSD) in participants whose first language was, or was not English.

<table>
<thead>
<tr>
<th></th>
<th>No depression</th>
<th>Depression</th>
<th>Row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>First language English</td>
<td>Expected 42.2</td>
<td>10.8</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>Observed 41</td>
<td>12</td>
<td>53</td>
</tr>
<tr>
<td>First language non English</td>
<td>Expected 4.8</td>
<td>1.2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Observed 6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Column totals</td>
<td>33</td>
<td>27</td>
<td>60 (Grand total)</td>
</tr>
</tbody>
</table>

(Pearson’s chi-squared $\chi^2 = 1.705$, df = 1, $p = 0.33$, non-significant).

Table 5: Observed and expected frequencies of emotionalism (PLACS) in participants whose first language was, or was not English.

<table>
<thead>
<tr>
<th></th>
<th>No emotionalism</th>
<th>Emotionalism</th>
<th>Row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>First language English</td>
<td>Expected 44.9</td>
<td>8.1</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>Observed 45</td>
<td>8</td>
<td>53</td>
</tr>
<tr>
<td>First language non English</td>
<td>Expected 5.1</td>
<td>.9</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Observed 5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Column totals</td>
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<td>9</td>
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</table>

(Pearson’s chi-squared $\chi^2 = 0.107$, df = 1, $p = 0.819$, non-significant).

Table 6: Observed and expected frequencies of emotionalism (House) in participants whose first language was, or was not English.

<table>
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<tr>
<th></th>
<th>No emotionalism</th>
<th>Emotionalism</th>
<th>Row totals</th>
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<td>First language English</td>
<td>Expected 42.3</td>
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</tr>
<tr>
<td></td>
<td>Observed 42</td>
<td>12</td>
<td>54</td>
</tr>
<tr>
<td>First language non English</td>
<td>Expected 4.7</td>
<td>1.3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Observed 5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Column totals</td>
<td>47</td>
<td>13</td>
<td>60 (Grand total)</td>
</tr>
</tbody>
</table>

(Pearson’s chi-squared $\chi^2 = 0.98$, df = 1, $p = 0.904$, non-significant).
4.2 Data screening: Additional data

Figure 1: Boxplots for the study measures showing the outliers on the PLACS laughter scale and to a lesser extent on the PLACS total scale.

Figure 2: Boxplots for the transformed PLACS-L and PLACS-T.
Figure 3; Scree Plot from the Factor analysis

Factor analysis: Scree Plot

Eigenvalue

Factor Number
<table>
<thead>
<tr>
<th></th>
<th>HADS-A</th>
<th>HADS-D</th>
<th>HRSD</th>
<th>PLACS-L</th>
<th>PLACS-C</th>
<th>PLACS-T</th>
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<td>Sig.</td>
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<td></td>
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<tr>
<td>HADS (D) Pearson's r</td>
<td></td>
<td>.000</td>
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<td>Sig.</td>
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<td></td>
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<tr>
<td>HRSD Pearson's r</td>
<td>.000</td>
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<td>1.00</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>PLACS (L) Pearson's r</td>
<td>-.151</td>
<td>-.178</td>
<td>-.271*</td>
<td>1.00</td>
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<td></td>
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<tr>
<td>Sig.</td>
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<td>.089</td>
<td>.020</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>PLACS (C) Pearson's r</td>
<td>.228*</td>
<td>.223*</td>
<td>.285*</td>
<td>.272*</td>
<td>1.00</td>
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<td>.135</td>
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Table 7: Additional correlational analysis using Pearson's correlation coefficient *Correlation significant at the 0.05 level and ** 0.01 level (1-tailed)
References


to brain areas involved in serotonergic neurotransmission. Stroke, 25: 5, 1050-1052.


