Alternatives to the Fixed-Set Model: A Review of Appraisal Models of Emotion

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Over several decades, appraisal theory has emerged as a prominent theoretical framework explaining the elicitation and differentiation of emotions, and has stimulated a great deal of theorising and empirical research. Despite the large amount of research in this area, there are many aspects of appraisal theory and research that remain unclear or problematic. In this review we identify a common assumption of many appraisal theories – the fixed appraisal set – and argue that this assumption, combined with a lack of explicit theorising about the predicted relationship between appraisals and emotions, leads to a lack of clarity in both appraisal models and the empirical testing of those models. We recommend that appraisal theorists move in a direction already taken by a small number of theorists, and adopt the starting assumption of a *variable* appraisal set. We further suggest that theories of concepts and categorization may inform theorising about appraisal-emotion relationships.

Keywords: cognitive appraisal; appraisal theory; emotions; emotional responses; categorisation

Appraisal theory has emerged as a prominent framework for explaining the elicitation and differentiation of emotions¹. It has done so because it accounts for an important feature of emotion: that the object of emotion is not necessarily the world as it is, but rather the world *as I see it* (Solomon, 1976). The notion underlying appraisal theory is that personal evaluations of events – rather than the situations themselves – are crucially important in both eliciting and differentiating emotions. This allows appraisal theory to account for some characteristics of emotional experience that may not be adequately explained by other kinds of theories: how different individuals experience different emotional reactions to the same event, and how different events can elicit the same – or similar - emotional reactions (see Roseman & Smith, 2001).

Numerous appraisal theories or models – which specify the particular appraisals associated with the experience of different emotions – have been developed and, where they have been tested empirically, have shown that different emotions tend to be associated with different configurations of appraisals. Yet there remain aspects of appraisal theory and research which are often implicit or lack clarity; in particular, the frequent assumption of what we will refer to as a ‘fixed set’ of appraisal dimensions and the particular kind of association hypothesised between appraisals and emotions.

In this paper, we explore the history of appraisal theory, critique the typical structure of appraisal models and propose new directions for appraisal research. Our goal in this paper is threefold. First, we wish to call attention to a ‘default assumption’ that appears in many prominent writings about appraisal theories, which we call the assumption of a fixed appraisal set (to be clarified later), and to a lack of clarity in many appraisal writings about the kind of relationship hypothesised between appraisals and emotions. Second, we review various attempts made by appraisal theorists to weaken, or avoid the implications of, the fixed appraisal set, and suggest that a more generative theoretical move is to alter the default assumption to what we call a *variable* appraisal set. Finally, we suggest some future directions for appraisal theory; in particular, how appraisal theory development can draw on the literature on concepts and categorisation.

Appraisal Theory and the Fixed Set

Over approximately half a century, numerous theories have been proposed and tested which specify: 1) the number and identity of the specific evaluations that elicit or characterise emotional experience (i.e. the appraisal dimensions); and 2) how different configurations of

values on those dimensions account for the elicitation of, or characterise, different emotions (e.g. Arnold, 1960; Frijda, 1986; Lazarus, 1991; Leach, Snider & Iyer, 2002; Ortony, Clore & Collins, 1988; Roseman, 1991; Scherer, 1984; Smith & Ellsworth, 1985; Solomon, 1976; Tracy & Robins, 2004; Weiner, 1985). Although these theories differ in a number of ways – including which appraisal dimensions and emotions are included, and which combinations of appraisals correspond with which emotions – many of these theories have a similar basic structure. In most of these models, a – often relatively small – set of appraisal dimensions is specified, each event is thought to be appraised along those dimensions, and the particular configuration of appraisals a person makes determines which emotion is experienced. Since the set of dimensions is assumed to be the same for each situation and emotion, we will refer to this kind of model as a *fixed set* model. The fixed set seems to be a generally acknowledged feature of appraisal theory – although some models contain variations to, or modifications of, this basic structure – as evidenced by descriptions of appraisal theory in several reviews, including Roseman and Smith's (2001) in which they state that 'since the same appraisals...in different combinations appear to be involved in the production of multiple emotions... *each distinct emotion is elicited by a distinctive pattern of appraisals*' (p.6, emphasis in the original). Moors (2009), too, has described the way in which appraisal theorists have

'come up with a set of appraisal variables. Each variable deals with one aspect of the encounter. The values on these variables combine to form an appraisal pattern. It is assumed that each specific emotion is caused by a unique appraisal pattern'

Thus, it is the *pattern* of appraisals made along the same set of dimensions, rather than the appraisal dimensions themselves that is thought to differentiate emotions.

Leach et al.'s (2002) appraisal model of intergroup emotions can be used to illustrate the fixed set structure. They specify four appraisal dimensions on which they plot the positions of nine different emotions. Taking just two of these emotions – pride and moral outrage – as examples, the assumptions of the fixed set model can be explicated. As Table 1 shows, the *set* of appraisal dimensions is exactly the same for the two emotions (and, indeed, all the emotions Leach and colleagues consider); it is only the *configuration* which changes. Indeed, many of the positions fixed on the appraisal dimensions are exactly the same for these two seemingly very different emotions (i.e. unstable advantage, high control). This kind of model is one we would describe as a *strong* fixed set model: each emotion is

allocated a position on exactly the same set of appraisal dimensions. Under such a model, each emotion would occupy only one position in a multidimensional appraisal space.

Insert Table 1 about here

Weak Fixed Set Models

While a small number of appraisal models adopt the strong fixed appraisal set described above, many models adopt what we would call a ‘weak’ fixed set; that is, the general structure of the fixed set is retained, but with exceptions to three major tenets of the fixed-set model: 1) that the same appraisal set is required for the elicitation of all emotions; 2) that the complete set of appraisals must be made (or that each emotion must occupy a specific position on each dimension); and 3) that the appraisal dimensions are continuous (varying from high to low) rather than nominal. Richard Lazarus’ (1991) and Klaus Scherer’s (1984) appraisal models, as well as the numerous iterations of Ira Roseman and colleagues’ model (Roseman, 1984, 1991, 2013; Roseman, Antoniou & Jose, 1996; Roseman & Evdokas, 2004; Roseman, Spindel & Jose, 1990) are those that we would classify as weak fixed set models.

The first departure from the strong fixed set model is to specify a set of appraisal dimensions which applies to *most* emotions in the model, but one or more of those dimensions are deemed irrelevant to one or more emotions. An example of this can be found in the work of Roseman and colleagues: though they do not explicitly state that a fixed set model is inappropriate, their appraisal typology appears to imply that certain emotions can be elicited by more than one configuration of appraisals. Table 2 presents an example from Roseman (1991) showing the hypothesised appraisal bases of fear, sadness and distress. While all three emotions are elicited by events appraised as motive inconsistent, having an appetitive or aversive motiveⁱⁱ is only relevant to sadness and distress. This implies that events appraised as motive inconsistent and uncertain will elicit fear regardless of whether one had an appetitive or aversive motive. This represents an implied departure from the strong fixed set model, as fear occupies more than one position in the multidimensional appraisal space. A second, very similar, departure from the fixed appraisal set has been to specify the position of an emotion on a particular appraisal as ‘open’ (e.g. Scherer, 1984;

Solomon, 1976), suggesting that any position on that appraisal is compatible with the elicitation of that emotion.

We should note however, that this means of weakening the fixed set raises a question about whether the appraisal *set* is still fixed, although the appraisal configuration may vary. Leaving certain dimensions ‘open’ implies that the value fixed on that dimension for a particular emotion may vary, but the appraisal *set* (i.e. the appraisal dimensions that must be considered) may still be the same. To use the earlier example from Roseman (1991), fear may be experienced if one has either an appetitive or aversive motive, but it is unclear whether fear could be experienced if one had neither motive (if that is possible), or if one was unaware of one’s motive. Thus, it is unclear whether the same set of appraisals must still be made (even if an emotion can occupy more than one position on some dimensions) or whether the emotion can be experienced without considering those appraisals at all. Some comments from appraisal theorists suggest that the fixed set (as well as the fixed configuration) assumption can be weakened; for example, that appraisal dimensions should not be considered lists of criteria against which all situations are compared (Kappas, 2001), or that emotions can be generated by a simple (Frijda, 2013) or short-circuited (Scherer, 1984) appraisal process. Nevertheless, there is little discussion of this issue in appraisal research and theory.

Insert Table 2 about here

Another way in which appraisal theorists have weakened the fixed set model is to include appraisals that consist of a variety of qualitative judgements (and can be measured on a nominal scale rather than the ordinal or interval scale implied by the appraisal *dimension*). For instance, Lazarus’ (1991) appraisal typology includes an appraisal of ‘ego-involvement’ which addresses the kind of relationship the appraiser has to the situation. Rather than an appraisal of more or less ego-involvement, it is an appraisal of the *kind* of ego-involvement; for example, is it a moral situation, a social situation or one which affects one’s ideals for the self? This type of qualitative appraisal allows a small number of appraisals to account for a large number of emotions without including appraisals of each of those specific kinds of ego-involvement (each of which would likely only be relevant to a small set of emotions). This

kind of appraisal is also evident in Solomon's (1976) appraisal theory in which some appraisals can take a wide range of nominal values. It should be noted, however, that this move to a nominal appraisal 'dimension' does not necessarily imply a strong divergence from the fixed appraisal set (i.e. situations are still appraised along the same set of dimensions) but a greater number of appraisal configurations is possible from a given number of dimensions.

The most explicit departure from the fixed set model among the appraisal theories reviewed thus far also comes from Lazarus (1991), who states for each emotion which of his appraisal dimensions are necessary for its elicitation, and which others are not necessary but may modify the experience of that emotion. While this still seems to imply that all situations are appraised along the same six dimensions, different subsets of appraisals are necessary for different emotions. Thus, despite the majority of previous appraisal theories suggesting a fixed-set structure, in some cases attempts appear to have been made to weaken that assumption.

Problems with the Fixed Set

It is our contention that there are a number of conceptual problems or questions that arise when appraisal models are developed using a fixed appraisal set.

Predicted Appraisal-Emotion Relationship

The major issue (common to both strong and weak fixed set models) is that the nature of the conceptual relationships that are expected to exist between appraisals and emotions is often unclearly specified (as previously noted by Kuppens, van Mechelen, Smits & De Boeck (2003)). For instance, are appraisals hypothesised to be necessary or sufficient features of an emotion, or merely correlates of an emotion? Most fixed set models seem to imply *necessary* appraisal dimensions, since they appear to specify a common set of appraisal dimensions along which every emotion-eliciting situation is appraised. Intuitively, however, there seems to be no reason why such a wide range of emotions should entail appraisals along exactly the same set of dimensions, and often some - or even many - of the appraisal dimensions specified seem on the face of it to be irrelevant to certain emotionsⁱⁱⁱ. Although appraisal theorists have argued that appraisal prediction tables should be read as *typical* – rather than necessary - appraisal profiles (e.g. Scherer, 2001), we have little indication of where most appraisal theorists stand on this matter, because most appraisal theories are silent on exactly what kind of relationship exists between appraisals and emotions. As a result, we are also

offered little indication of what kinds of results would count as empirical support for a particular model (an issue we address below). Perhaps more importantly, we are offered little indication of the empirical results that *would not* support a model, rendering those models, at best, open to a range of interpretations, and at worst, unfalsifiable.

There are numerous ways in which an appraisal and an emotion can be associated: an appraisal may be *necessary*, *sufficient*, *typical* or *modulating* (i.e. modifies the intensity of the emotion), and may indeed be associated with an emotion in more than one, or all, of those ways. In addition, most appraisal theories propose that each emotion is characterised by a specific configuration of values on several appraisal dimensions; thus, appraisal theorists must give some account of not only how individual appraisals are related to an emotion, but also the relationship between combinations of appraisals and an emotion. For example, showing that two different appraisals receive relatively high ratings when a particular emotion is experienced does not necessarily demonstrate that particular values must be fixed on *both* of these appraisals for the emotion to be experienced.

In specifying the predicted appraisal-emotion relationship, a distinction can be made between the quality of emotion (i.e. which emotion is experienced) and the intensity of that emotion. An explicit recognition of the quality/intensity distinction comes from both Lazarus (1991) and Frijda (1986), who have noted that emotions can be thought of as categories (i.e. the presence or absence of a particular emotion) or as dimensions (i.e. emotional intensity), but rarely do appraisal theorists explain precisely which appraisals they hypothesise to be associated with the elicitation of an emotion and which are associated with intensity. Depending upon the kind of appraisal-emotion relationship of interest, appraisals and emotions can be treated as either categories or dimensions. In order to consider whether an appraisal is necessary or sufficient for the experience of an emotion, emotions must be treated as categorical (i.e. emotion experienced or not when appraisal(s) is/are made), but to examine the effect of an appraisal on the intensity of an emotion would require emotions to be treated as dimensional. This issue is not often addressed in appraisal theorising or in the empirical verification of appraisal theories (as will be discussed below).

The importance of distinguishing between the necessity of an appraisal and some other association is highlighted when some emotions seem to require, and be distinguished from other emotions by, specific characteristic appraisals. When a fixed appraisal set is assumed, all (or most) emotions are allocated a position on appraisals which may only be

relevant to a small selection of emotions. For example, a number of appraisal theories contain an appraisal related to the agent responsible for, or cause of, the emotion eliciting event (see e.g. Smith & Ellsworth, 1985; Roseman et al., 1996; Scherer, 2001). While this kind of appraisal seems particularly important in distinguishing emotions such as anger, guilt, and pride, it is unlikely to be relevant to other emotions such as happiness and frustration which could be elicited in situations for which the self, others or nobody is responsible. Thus, for those latter emotions, it may not matter what position is fixed on that agency appraisal; indeed, it may not matter if that appraisal is considered at all, or if there is even information available to make that appraisal.

Exclusion Mindset

This second problem applies particularly to the weakening of the fixed set assumption conducted in a large number of appraisal theories, and in part explains why we believe the weak fixed set does not adequately address our criticisms of the strong fixed set. Although an improvement on the strong fixed set model, we believe the weak fixed set model is still inadequate, primarily because it does not alter the underlying model structure and means of theorising about appraisal-emotion relationships. The weak fixed set is still developed on the basis that the same set of appraisals characterises every emotion, but with exceptions. Beginning from the assumption of a fixed set, however, means that theorists are adopting an exclusion – rather than inclusion – mindset; that is, rather than trying to identify the appraisal dimensions that *are* relevant to a particular emotion, they are beginning from the assumption that *all* dimensions are relevant to all emotions, and then identifying those that *are not*. This makes it more likely that unnecessary appraisal dimensions will be retained than if they began without that assumption, and more likely that appraisal theorists will attempt to develop appraisal dimensions that apply to as many emotions as possible. An example of this comes from an early iteration of Ira Roseman's appraisal model (Roseman, 1984), in which a dimension of 'legitimacy' was shown to mainly apply to emotions such as anger and guilt. Rather than allowing that dimension to be restricted to those emotions, however, the dimension was altered to 'power' (of which legitimacy was designated a special case relevant only to frustration, anger and guilt). Thus, the fixed set assumption may lead appraisal theorists to design and develop their models in ways that fit the assumption (even when their models suggests that the fixed set assumption is not a strong one).

Empty Cells and Multiple Emotions

Two other minor problems with the fixed set assumption are worthy of attention. The first is that it is often left unclear what would occur if certain configurations of appraisals were made. An example comes from Leach et al.'s (2002) appraisal model of intergroup emotions which we reviewed above. In that model there are four appraisal dimensions on which each emotion is allocated a hypothesised position of 'high' or 'low'; thus, there is a total of 16 possible appraisal configurations. Only nine of those possible combinations, however, are assigned an emotion. This is the case because – under a fixed set model – each emotion must occupy only one position on each of the dimensions. If, however, some appraisal dimensions were deemed irrelevant to certain emotions, those emotions could occupy more than one position (i.e. high *and* low) on those dimensions, and in turn the model could explain the emotion experienced for a greater number of appraisal configurations. It should be noted at this point that we are not suggesting appraisal models need to account for every conceivable configuration of appraisals – in many cases, particular combinations may be unlikely or even incompatible, or may lead to emotional experiences that are not easily described using common emotion words – but merely that *more* configurations might be accounted for if the fixed set assumption were relaxed or, indeed, removed.

Another feature of fixed set models is that they do not seem to allow for multiple simultaneous, or blended, emotions. If each emotion is elicited by a different configuration of appraisals, and – under a strong fixed set model - each situation must be appraised along all the dimensions in the model, two different configurations could not possibly occur simultaneously. Even under a weak fixed set model, the probability of multiple emotions is diminished since it is likely that the appraisal profiles of any two emotions will contain at least one incompatible appraisal. For example, the appraisal prediction table from Scherer (2001) shows that even though some appraisal-emotion combinations are left 'open' the sheer number of appraisal dimensions (16 in total, with a range of 6 to 14 dimensions per emotion when accounting for 'open' appraisals) makes it quite unlikely that the appraisal bases of two or more emotions could occur simultaneously.

Although we recognise that the issue of simultaneous emotions is not a straightforward one – since extremely rapid switching between emotions is possible - the idea of multiple or mixed emotions holds a great deal of intuitive appeal, and is supported by research showing that individuals report combinations of emotions in response to a single

situation (e.g. Fernando, Kashima & Laham, 2014; Larsen, McGraw & Cacioppo, 2001; Larsen, McGraw, Mellers & Cacioppo, 2004; Siemer, Mauss & Gross, 2007; Williams & Aaker, 2002). Indeed, some appraisal theorists have explored the possibility of multiple emotions; for example, Smith and Ellsworth (1987) and Ellsworth and Smith (1988a,b) detailed the number of instances in which individuals reported more than one emotion in response to a single situation and showed substantial emotion ‘blending’ (in Ellsworth and Smith (1988b) just 6.3% of the sample reported only one emotion). A number of appraisal theorists have offered basic explanations as to how this might occur, proposing that it may be the result of an ‘incomplete’ appraisal process where individuals may ‘be uncertain of how they felt, or might vacillate between emotions’ (Smith & Ellsworth, 1985, p.819), or that the core sets of ‘central’ (Ellsworth & Smith, 1988a) or ‘typical’ (Scherer, 1984) appraisals for more than one emotion may be activated simultaneously and result in blended or hybrid emotions (see also Tong, 2010). Studies such as these have, however, neither explained in detail, nor empirically tested, the appraisals required for particular blends or combinations of emotions to be experienced.

In summary, the fixed set assumption is fraught with a number of conceptual problems and ambiguities. These problems, we argue, are carried forward to, and are also exacerbated by, the typical methodologies and data analytic strategies employed in providing empirical verification of appraisal models.

Empirical Tests of Strong and Weak Fixed Set Appraisal Models

Because both strong and weak fixed set models generally do not specify the predicted appraisal-emotion relationship clearly, empirical tests have reflected this lack of clarity. Empirical tests of appraisal theories have relied upon methodologies in which appraisal researchers look for: 1) relatively high ratings of an appraisal when a particular emotion is experienced; 2) relatively high levels of an emotion when an appraisal is made; or 3) a correlation between the strength of an appraisal and the intensity of an emotion. And as Ellsworth and Scherer (2003) have noted, appraisal theories have been tested using three major methodologies. In the first of these, participants are asked to recall a situation in which they had experienced a particular emotion and then to rate the extent to which that situation is characterised by each of the appraisals in the model (e.g. Frijda, Kuipers & ter Schure, 1989; Gehm & Scherer, 1988; Roseman et al., 1990; 1996). The usefulness of a particular appraisal dimension for differentiating emotions is usually inferred when an appraisal receives a

relatively high rating compared to other appraisals for a given emotion, or when it receives a relatively high rating compared to its rating on other emotions. The opposite strategy has also been employed; that is, to ask participants to recall a situation characterised by a particular appraisal, and to rate that situation on the extent to which they experienced different emotions (e.g. Tesser, 1990).

When appraisal models are developed or tested in this way one runs the risk of interpreting chance associations between appraisals and emotions as relationships of necessity. Although participants *can* rate the experience of an emotion along any number of dimensions, it is by no means necessary that they *must* do so in order to experience that emotion, nor that that appraisal necessarily influences the emotion they experience. When they are, nevertheless, asked to rate the experience of an emotion on a large number of appraisal dimensions, some unexpected and counterintuitive associations may emerge. This may occur because the emotion in question is characterised by that appraisal in some, but not all, situations; or simply because participants are forced to make some rating of seemingly irrelevant appraisals. The problem is compounded because participants tend to recall instances of experiencing an emotion that are particularly stereotypical of that emotion (Nezlek, Vansteelandt, Van Mechelen & Kuppens, 2008; Parkinson, 1999). Thus, there is an overemphasis on the appraisals made in *typical* instances of an emotion, rather than those made in all, or most, experiences of that emotion. Under these conditions, merely correlated appraisals may be interpreted as necessary, and appraisal-emotion associations may emerge that are intuitively strange or would only apply in certain situations. For example, Frijda et al. (1989) showed happiness and enthusiasm to be associated with an appraisal that the well-being of someone else is affected by a situation; while this is certainly true in some circumstances, it is easy to imagine a situation in which one would feel happy about something which affected only oneself (e.g. if one were to fare well on an exam).

The second common method in appraisal research – which, incidentally, has been used extensively in studies of intergroup emotion (e.g. Branscombe & Miron, 2004; Iyer, Leach, & Crosby, 2003; Iyer, Schmader, & Lickel, 2007) – has been to examine whether appraisal ratings of a common situation predict emotion ratings, using regression-based statistical techniques (Smith & Ellsworth, 1987; Siemer et al., 2007). As in the previous methodology described above, this does not distinguish between the elicitation of the emotion and the intensity of that emotion, and can therefore lead to counterintuitive results. For example, Siemer et al. (2007) showed self-responsibility to be a significant

predictor of sadness. Although self-responsibility is not completely irrelevant to sadness, and would be associated with it in *some* situations, one can easily imagine situations about which one could feel sad for which one is in no way responsible (e.g. if a friend passed away). Thus, we are unsure of the role that significant appraisal predictors play in the elicitation or modulation of particular emotions, or whether the relationships found in a particular experimental context will generalise to other experiences of that emotion.

The third common methodology involves appraisal researchers systematically constructing vignettes which manipulate particular combinations of appraisals (e.g. Roseman, 1991; Smith & Lazarus, 1993; Smith, Haynes, Lazarus & Pope, 1993; Tracy & Robins, 2006, 2007; Weiner, Graham & Chandler, 1982), or asking participants to remember situations which satisfy a set of appraisal criteria (e.g. van Mechelen & Hennes, 2009). This kind of technique has two advantages over other common empirical investigations of appraisal-emotion relationships: 1) it treats appraisals as categorical (i.e. present or absent in the vignette/situation), providing clarity as to the nature of the relationship being investigated; and 2) it allows one to examine the effects of combinations of multiple appraisals by manipulating their presence or absence. Nevertheless, these studies typically show relationships between specific combinations of appraisals and the intensity of different emotions, but it remains unclear whether those appraisals were required for the *elicitation* of those emotions.

In general, all of these techniques for testing appraisal theories show *some* association between appraisals and emotions, but provide little indication as to the nature of that relationship. Where appraisal models do not specify the predicted relationship between appraisals and emotions, *any* kind of statistical association between them can be taken as support for the hypotheses of that model. Furthermore, appraisal models typically assert that emotions are characterised by *patterns of appraisal* rather than single appraisals, thereby necessitating an analysis which shows that *all* of those appraisals are made when the emotion is experienced. Although some studies have tested interaction effects between appraisals (e.g. Goetz, Frenzel, Stoeger & Hall, 2010; Tong et al., 2007), most appraisal research has used statistical techniques which only address the relationship between emotions and individual appraisals, and therefore cannot show that multiple appraisals combine in the elicitation or experience of a single emotion.

In recent times, appraisal research has expanded into some new and interesting methodologies. Appraisal researchers have used ecological momentary assessment and experience sampling (e.g. Nezlek et al., 2008; Tong, 2010; Tong et al., 2007), new and unusual stimuli including poems and paintings (Silvia, 2008; Silvia, Henson & Templin, 2009; Turner & Silvia, 2006), and situational appraisal manipulations (Roseman & Evdokas, 2004), to better link appraisal research to real stimuli and real, currently-unfolding events. Other methodologies such as priming certain appraisals (Neumann, 2000) and coding open-ended accounts of emotion experiences (Fischer, 1999) have also been employed. These studies have, however, still employed very similar data analytic strategies to other appraisal research (reviewed above). Thus, while these are important methodological advances, they retain the lack of clarity regarding the relationship between appraisals and emotions characteristic of much ‘traditional’ appraisal research.

Variable Set Models: A New Starting Assumption

Earlier, we stated that the weak fixed set model does not adequately address the criticisms we have raised of both the development and testing of fixed appraisal set models. Some appraisal theories have made a more radical shift to the underlying assumption, to what we call a “variable set” assumption. We suggest that it is more productive to revise the starting assumption of appraisal models: to explicitly begin from the notion that emotions are elicited or characterised by *different* sets of appraisal dimensions. Of course, these appraisal sets may overlap, and indeed there may be a small number of appraisals that are common to a range of emotions. This does not mean, however, that we should begin from the assumption that this same set of appraisals is relevant to *all* emotions.

Some appraisal theorists appear to have begun to move towards the revised starting assumption that we are advocating, and have expressed this in a number of ways. Firstly, some appraisals theorists have limited their testing of appraisal-emotion relationships to a small number of appraisals they believe will be relevant or central to a particular emotion. For example, Silvia (2008) and Turner and Silvia (2006) restricted their analysis of the appraisal basis of interest to just two appraisals - coping potential and complexity – drawn from Scherer’s (2001) larger set of appraisal dimensions. Thus, appraisal theorists have implicitly suggested that some appraisals are not relevant to certain emotions. Similarly, a number of appraisal theorists have explicitly made reference to ‘core’ or ‘central’ appraisals (e.g. Ellsworth & Smith, 1988b; Scherer, 1984). The clearest exposition of the notion that

there is some core or diagnostic appraisal content for each emotion comes from Smith and Lazarus' (1993) work on core relational themes. These constitute a more 'molar' level of analysis (as opposed to 'molecular' appraisal dimensions) and are designed to capture the central meaning derived from the configuration of appraisal dimensions corresponding to each emotion.

Another way in which appraisal theorists have moved away from the fixed set is by making comments acknowledging that emotions can be experienced without making all of the appraisals in the model; this theorising has, however, tended to be stated in somewhat vague terms and with little reference to its implications for appraisal models and the empirical testing thereof. For example, Moors, Ellsworth, Scherer and Frijda (2013, p.121) have commented that where a small number of appraisals are made, 'undifferentiated or global' emotional experiences result, whereas when many appraisals are made 'highly differentiated or specific' emotions are experienced. Similarly, as noted above, a number of appraisal theorists have suggested that emotions can be experienced without needing to 'check' the complete set of appraisals (e.g. Frijda, 2013; Kappas, 2001; Roseman, 2013b; Scherer, 1984).

Explicit critique, or diversion from, the fixed appraisal set – and specific theorising on the basis of that critique – has, however, been limited, and in only a couple of cases have appraisal theorists explicitly proposed different appraisal sets for different emotions. Tracy and Robins' (2004) model of interpersonal self-conscious emotions is a case in point. It explicitly takes the view that the elicitation of self-conscious emotions (e.g. guilt, shame, pride) requires a more complex set of appraisals than does the elicitation of basic emotions (e.g. fear, joy). According to this model, basic emotions will be elicited by a relatively small set of appraisals associated with survival goals, but self-conscious emotions are more cognitively complex, and require additional appraisals – to do with evaluations of behaviour, and representations of the self and others – which go beyond simple survival/goal-relevance.

Not only does Tracy and Robins' model clearly specify different sized appraisal sets for different kinds of emotions, but even among the self-conscious emotions, the appraisal set appears not to be the same size. Although guilt and shame are hypothesised to require stability and globality appraisals, embarrassment can be elicited without consideration of these two appraisals. In this way, although the full appraisal space may contain a certain

number of dimensions, some emotions can be elicited without reference to this full set of appraisals.

Bernard Weiner's (1985; 1986) attribution theory of emotion in achievement-related contexts seems to take a similar form. In this theory, a simple appraisal of whether a goal has been attained or not elicits 'general' emotions of happiness or sadness/frustration, respectively. More complex appraisals may then be addressed to the cause of such events, particularly to the causal locus, and the stability and controllability of the cause. These more complex appraisals are theorised to elicit what Weiner refers to as 'distinct' emotions such as pride, hope, shame, guilt, anger and gratitude.

One of the central aspects of both these models - and a clear difference between theirs and other appraisal models - is that they clearly identify a particular set of emotions (i.e. 'self-conscious' emotions or 'distinct' emotions) and show that these emotions involve different mental processes, serve different needs, and, most importantly for the present purposes, are characterised by a different set of appraisals. The theorising of Tracy and Robins, and Weiner, identifies two 'sets' of emotions: basic and self-conscious/distinct; this idea could be taken further to imply that there are numerous kinds of emotions, each elicited by different sets of appraisal dimensions. An appraisal theory which does take this kind of logic a step further is that of Ortony et al. (1988). They identify three central appraisals - desirability, praiseworthiness, and appealingness - which elicit three different kinds of emotions (event-based, agent-based and object-based, respectively). Each of these three different 'branches' of appraisal are then further elaborated by other appraisals which do not apply to emotions located on the other two branches. In this sense, Ortony et al (1988) appear to begin from the assumption of *different* sets of appraisal dimensions for different emotions.

Why the Fixed Set Model?

Having critiqued the fixed set appraisal model and presented an alternative in the variable set model, it is of interest to briefly consider why a fixed set model has been preferred in the majority of appraisal theory, and one may wonder whether this is due to implicit assumptions underlying appraisal theories^{iv}. We do not wish to suggest that previous appraisal theorists simply did not consider alternative model structures - although an element of convention and consistency with previous theory may have played a role - but rather that a fixed appraisal set may have been more congruent with a broader theory of emotion. Indeed,

although appraisal theory does not oblige them to do so, some appraisal theorists may consider that the range of emotional experiences is constrained to those that are associated with evolutionary adaptational significance (corresponding to the major emotion categories), and that therefore the potential elicitors of those emotions (i.e. appraisal dimensions) will be similarly constrained. An explicit example of constraining the potential appraisal ‘space’ can be found in Lazarus (1991) who limits the scope of appraisal specifically to evaluations of personal significance, while designating other information including causal attributions to a different form of cognition labelled ‘knowledge’.

Nevertheless, we believe that whether one takes a biologically-oriented view of emotion is orthogonal to whether one takes a fixed or variable set approach to appraisal; indeed, the variable set approach may in a sense be *more* congruent with this view than the fixed set. If different emotions are considered to have different adaptational functions, it also makes sense that they – at least to some extent – would have different elicitors which are of specific relevance to those functions (and which are not relevant to other emotions with different functions). Thus, within a general appraisal ‘space’, a variable set model would allow for certain (sets of) appraisal dimensions to be associated with certain (sets of) emotions based on their particular adaptational significance.

Future Directions

Testing Variable Set Models

In this paper we have offered analysis and criticism of the typical methodologies used to validate appraisal models of emotion, and this may prompt the question of what we would do differently. Firstly, as we have stated, a major deficiency of much extant appraisal research is a lack of explicit theorising about the expected appraisal-emotion relationship, and this theorising should form a first step in any analysis (we suggest some steps that could be taken in this regard below). Secondly, we believe a multi-method strategy may be the best way to obtain the most complete picture of the relationship between any set of appraisals and emotions. As has been noted by a number of appraisal theorists (Goetz et al., 2010; Moors, 2013; Smith & Ellsworth, 1987), choosing any one of the methodologies we have reviewed above, involves a trade-off of advantages; for example, rating appraisals and emotions of a single real-life situation allows for greater real-world relevance, but less experimental control over appraisals/emotions, while participant generated situations allow for a greater generality of emotion-eliciting situations, but participants responses may be more stereotyped and less

‘real’. In the former, one is likely to detect appraisal-emotion relationships that are situation-specific (see earlier example from Siemer et al., 2007), and in the latter, one is likely to detect very ‘typical’ appraisal-emotion relationships. For this reason, we believe it would be most profitable to test the same appraisal-emotion relationships across these and other techniques (e.g. vignettes) and between them to construct an image of appraisal-emotion relationships. This kind of work can also incorporate novel statistical and methodological techniques that have emerged in recent years to test specific appraisal-emotion relationships (but have not been applied to the systematic examination of a fully articulated appraisal model), such as appraisal necessity and sufficiency indices (Kuppens, et al., 2003; Tong, 2010) which determine the proportion of cases in which a given appraisal (or combination of appraisals) was or was not made when a particular emotion was experienced.

Using some of the newer experimental techniques described above, appraisal theorists can also begin to examine whether certain appraisals need to be considered at all for a particular emotion to be experienced (as opposed to examining the position fixed on appraisal dimensions). Using vignette studies, and other methods which manipulate the appraisal content available to participants (e.g. Roseman & Evdokas, 2004), researchers can ascertain the extent to which emotions can be elicited without consideration of, or sufficient information available to make, certain appraisals. Siemer and Reisenzein’s (2007) reaction time methodology – which examines whether making an emotion judgement ‘facilitates’ an appraisal judgement – may also be used to investigate whether certain appraisal information is activated at all when an emotion is experienced (regardless of the value fixed on that appraisal dimension).

Appraisal as Categorisation

In this paper we have recommended that the development of appraisal models begin from the explicit assumption of different sized appraisal sets postulated for different emotions or families of emotion. This new assumption suggests that rather than thinking of appraisal as a process of assessing events using a predetermined set of appraisal dimensions, one can conceptualise it as a process of extracting and encoding whatever information happens to be available. Thus, appraisal processes can be thought of as akin to categorisation in which one constructs a representation of an event in terms of features (appraisals) extracted from that

event. Indeed, throughout this paper we have used the language of necessity and specificity which is derived from theories of categorisation.

There are several processes by which categorization has been theorized to occur. The so-called 'classical view' assumes that categories are represented such that all members of a category share common features; any exemplar possessing these features is classified as a member of the category and any exemplar that does not possess all of these features is not a member (Medin & Smith, 1984; Rosch, 1975). This view would correspond with an appraisal model specifying the necessary (i.e., without any one appraisal, the emotion would not be experienced) and collectively sufficient (i.e., an emotion must be experienced if all appraisals are made) appraisals for each emotion.

A problem for the classical view, however, is that it has proved difficult to specify the necessary and sufficient features of many concepts (Lakoff, 1973; Rosch & Mervis, 1975; Wittgenstein, 1958). Under a probabilistic view, concepts do not have defining features, but rather are represented in terms of characteristic or probable properties (Rosch, 1975; Rosch & Mervis, 1975). If the probabilistic view were adopted, there would not be necessary and sufficient appraisals that must be made in all instances of a particular emotion, but rather a number of appraisals that can additively increase the typicality (and possibly the intensity) of a given emotion experience as an instance of the emotion category.

Although a number of studies have examined either single emotions (e.g., Fehr & Sprecher, 2009; Parrott & Smith, 1991; Russell & Fehr, 1994), or a variety of emotions (e.g., Fitness & Fletcher, 1993; Russell, 1991), from a probabilistic perspective, this research does not correspond precisely with the appraisal-emotion relationships of interest here because the emotion prototypes examined in those studies have included, but not been limited to, appraisals. These studies are likely to have detected one or two particularly salient appraisals that (along with other characteristics of an emotion experience such as physiological symptoms and behaviours) best represent the emotion in its totality.

The classical and probabilistic views can also be combined to form a hybrid view, wherein there is a set of necessary and sufficient criteria for a concept, but an additional set of features which is capable of modifying the extent to which a given exemplar is typical of that category (Armstrong, Gleitman, & Gleitman, 1983; Kamp & Partee, 1995; Medin & Smith, 1984). If one were to apply this view to emotions, there would be a minimum set of appraisals that must be made for an emotion to be experienced, but a number of other

appraisals which may be particularly salient when thinking about that emotion, making it a more typical experience of that emotion. If, as argued by Scherer (2001), appraisal theories have thus far specified the most typical configuration of appraisals for each emotion (rather than only those which are necessary/sufficient), it seems likely that existing appraisal theories already describe something of this sort (without, of course, specifying which appraisals form the necessary/sufficient core, and which increase typicality).

It is also possible that additional appraisals may increase the intensity of that emotion. This perspective is consistent with Lazarus' (1991) appraisal theory where for each emotion he specified which appraisals were necessary and which might modulate the intensity of that emotion. Among extant appraisal theories, it seems that only Ortony et al. (1988) have addressed the notion of emotion intensity at length, and they specify a number of variables which are likely to modulate the intensity of most emotions (e.g. arousal, proximity), and those which are relevant to the intensity of only specific emotions.

In addition to the kinds of categorisation described above, there remain numerous other possibilities regarding how appraisals and emotions might be associated. One such possibility can be derived from the work of Barrett (2006a). She has proposed that, rather than a single concept for each emotion, there are numerous different scripts or 'recipes' for each emotion (Barrett, 2006a; 2009). Each of these different scripts will contain a subset of the total information an individual has about that emotion, and will contain properties relevant to a certain type of situation which elicits that emotion. Although Barrett's work is not about appraisal per se, this notion has implications for appraisal research: firstly, it raises the question of whether these different scripts can be accounted for by a common appraisal basis, or if there are numerous appraisal combinations which elicit a single emotion; secondly, if the latter is true, can these different appraisal bases be identified for each emotion, and the circumstances in which one appraisal basis rather than another is activated.

Although much appraisal research has taken the perspective that there is a single configuration of appraisals associated with each emotion, some research has shown that the appraisal basis of a single emotion may vary (i.e. there is more than one set of sufficient appraisals for each emotion) (Kuppens et al., 2003; Kuppens, Van Mechelen & Rijmen, 2008; Silvia, 2008; Silvia et al., 2009; van Mechelen & Hennes, 2009), or that there are individual differences in the appraisal configurations that elicit an emotion associated with personality (Tong, 2010) or cultural factors. While these findings add another layer of

complexity to the investigation of appraisal-emotion relationships, we believe these findings only bolster many of the points we have made about the need for clarity regarding the intended relationship between appraisals and emotions, and the methods used for testing those relationships. For example, it has not always been clear from studies investigating multiple appraisal bases whether different configurations of appraisals determine whether an emotion is elicited or its intensity (e.g. Kuppens et al., 2008; Tong, 2010), or whether the difference is in the appraisals made or the strength with which those appraisals are made (Silvia, 2008; Silvia et al., 2009). Furthermore, as noted by Silvia et al. (2009), if individual differences exist, traditional methods in appraisal research (reviewed above) will most likely aggregate them into the 'typical' appraisal structure. Analysis using multiple methods and newer methodologies such as necessity and sufficiency indices or latent class analysis (Silvia et al., 2009), have the potential to clarify appraisal research and incorporate the potential for multiple appraisal bases.

Conclusion

In this paper we have reviewed extant appraisal research and theory, and identified the common assumption of a fixed appraisal set, which we believe to be problematic. We have also identified two ways in which appraisal theorists have sought to move away from this assumption: 1) by retaining the assumption, but with exceptions, or 2) by moving towards the alternative assumption of a variable appraisal set. With regard to the former, we have argued that although this addresses some concerns, it remains problematic, especially with respect to the lack of explicit theorising as to the predicted relationship between appraisals and emotions. We suggest that appraisal research would benefit from more complete articulation of the predicted association between appraisals and emotions, and a movement away from the assumption of a fixed set of appraisal dimensions towards a variable set assumption.

Incorporating the different ways in which appraisals and emotions could be related raises a number of further questions and research directions for appraisal theory. For instance, can appraisals which are not necessary or sufficient for an emotion, but alter the intensity or typicality of that emotion, be identified? Also, where do the concepts — against which extracted appraisals are compared — come from? Barrett (2006a, b) has proposed that, rather than being biologically given — emotion concepts are constructed through personal experience and culture, and would therefore seem to be, at least to some extent, idiosyncratic. Such a notion might make the search for the singular appraisal basis of each emotion seem

futile, yet the importance of recognising and communicating emotions between individuals suggests relatively strong similarity in those concepts (at least within a particular culture). Future appraisal research could turn to establishing the extent to which there is consistency within and between individuals in the appraisal content of specific emotions; identifying the (potentially) multiple appraisal bases of specific emotions; determining to what extent the numerous 'scripts' comprising knowledge of an emotion can be accounted for by a common appraisal basis; and tracing the sources of variability in appraisal-emotion relationships across situations and between individuals.

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Table 1.

Appraisal Dimensions Hypothesised to Elicit Surprise and Disgust from Leach, Snider and Iyer (2002).

Appraisal dimension	Pride	Moral Outrage
Legitimacy	High	Low
Focus	Self	Other
Stability	Low	Low
Control	High	High

Table 2.

Roseman's Appraisal Dimensions Differentiating Fear, Sadness and Distress.

	Motive-inconsistent	
	Appetitive motive	Aversive motive
Uncertain	Fear	
Certain	Sadness	Distress

Footnotes

ⁱ It should be noted at this point that we are not seeking to contribute strongly to the ongoing debate about whether appraisals are causal, or merely characteristic, of emotions; indeed, we believe that both may be true in different circumstances. Echoing Roseman (2013) we believe that identifying other sources of emotion does not invalidate appraisal theory and that although there may be circumstances in which appraisals are not – or are not the only – elicitors of emotion, distinctive patterns of appraisal can still apply to almost all, or the majority of, occurrences of an emotion. Thus, when we use terms such as ‘necessity’ in this article, we are referring to whether an appraisal is always empirically associated with an emotion, which may or may not reflect a causal relationship.

ⁱⁱ Appetitive and aversive motives refer to whether one’s motive in a given situation is to maximise reward or minimise punishment, respectively.

ⁱⁱⁱ When we speak of the ‘irrelevance’ of an appraisal, we mean either a) that there are many cases in which the emotion of interest is experienced without consideration of that appraisal or where insufficient information is available to make that appraisal or b) that if one does appraise along that dimension, the position (high or low) does not change the experienced emotion.

^{iv} We thank an anonymous reviewer for this suggestion and the example from Lazarus (1991) below.