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Actuarial occurrence of affective phenomena



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1 Introduction

One of the key intuitions behind HUMAINE is that there is a major part of human life to which Information Technology has paid very little systematic attention; and that people would benefit if more attention were paid to it. That kind of intuition was expressed on the first page of the Technical Annex, as follows:

emotion in the broad sense pervades human communication and cognition. Human beings have positive or negative feelings about most things, people, events and symbols. These feelings strongly influence the way they attend, behave, plan, learn and select. The feelings are conveyed e.g. in faces, voices, gestures, and postures; and people judge others by the way they respond to such signals. They seek out situations that are emotionally rich (not necessarily pleasant), and are persuaded as much by emotional appeal as by factual content.

People tend to agree automatically with the idea that emotion pervades human life, and yet there is not much formal evidence to support it. It is important for emotion-oriented computing to clarify the issue. It affects both the case for investing effort in the discipline at all, and judgments about the relative priorities of particular research topics within the area.

This report aims to provide the kind of evidence on these issues that seems relevant to the emotion-oriented computing community. Many of the key studies have been carried by HUMAINE members, though not always as part of HUMAINE. The evidence that they provide is far from definitive – that would require a full scale project in its own right rather than part of a strand of one workpackage. However, it is possible to provide ball park estimates that are empirically based, and to identify methods and issues that are relevant to future studies.

The report divides into two main parts. These correspond to two senses of the word ‘emotion’. One, the narrow sense, is being used when people say that an emotion is a specific kind of state that contrasts with (say) a mood. The other sense, the broad sense, is being used when people say that being moody is a kind of emotional state. The preliminary section expands on the difference, and gives data designed to make the issue clear. The next part of the report deals with studies whose main outcome is to clarify the prevalence of emotion in the narrow sense. The last main then deals with studies designed to clarify the prevalence of emotion in the broad sense.

The terminological issues implicit in that distinction have been a recurring source of difficulty for HUMAINE. Rather than being discussed at length here, these issues are covered in Deliverable 3i, “Emotional life: Terminological and conceptual clarifications”, and in more compressed form in the forthcoming HUMAINE handbook. The interdependence between the reports delayed production of this one.

2 Broad and narrow senses of ‘emotion’

A rough but useful indicator of prevalence across the range comes from a HUMAINE study using recordings from a TV series, ‘Castaway’. The TV production team filmed people continuously for a year in a challenging environment. From that, the HUMAINE team was given 10 tapes lasting about 30 mins each, which were chosen by the psychologist in the Castaway production team to convey the range of material that the year’s filming contained. That is certainly not a strictly representative sample of life (emotional or otherwise), but it seems to be less radically biased than any other large scale primary source that is available to study.

A rater watched all the tapes, and recorded his judgments about the broad kind of emotion that was present at any given time. The rating used three categories: unemotional; showing emotion in a strong sense; and elements of emotion, but not emotion in a strong sense. The full instruction pro forma is given in Appendix 1. Ratings were made by using a mouse to move a cursor back and forward on a scale which was divided into three blocks, each labelled with a short description of one of the categories. Although the task was essentially categorical, the position of the cursor within the box was also monitored, and on that basis, separate frequency counts were made for the upper (more emotional) and lower (less emotional) half of each block.

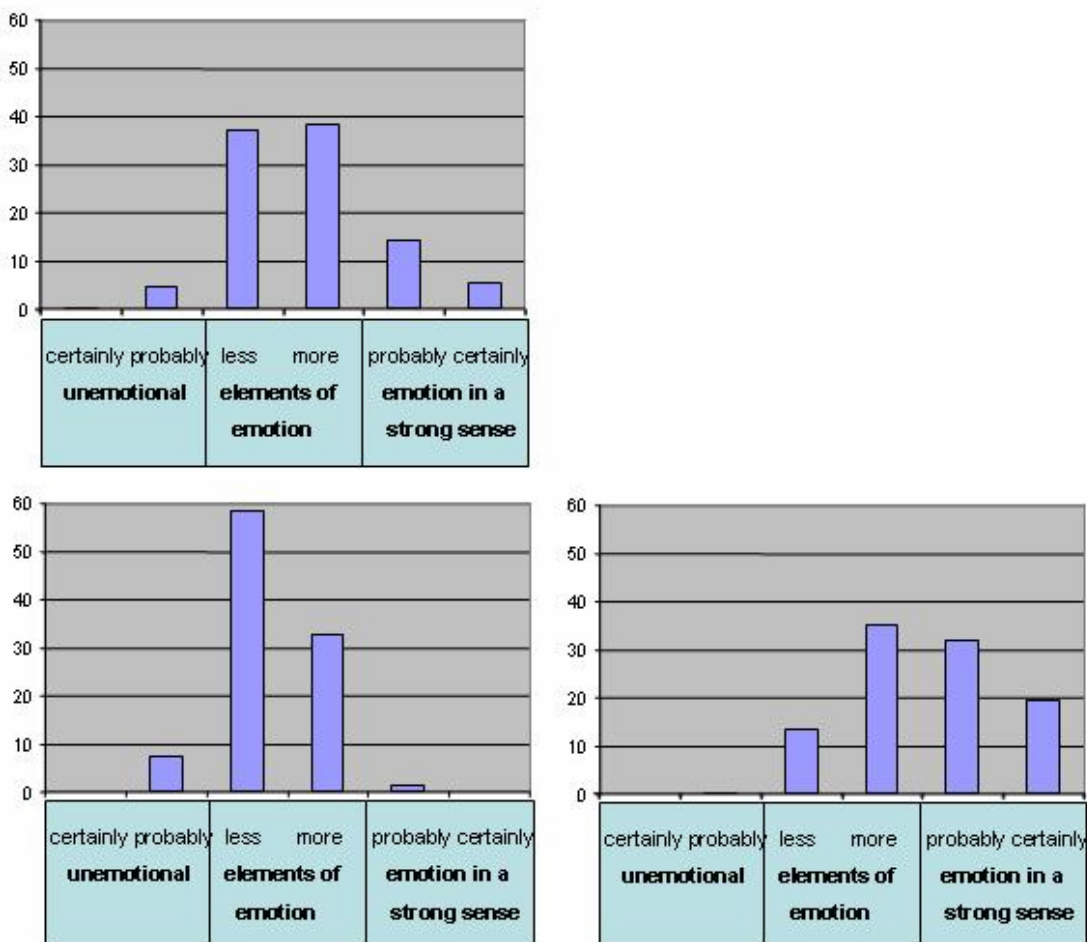


Figure 1: Judged distribution of three emotional categories in 5 hours of tapes which followed participants in the TV series ‘Castaway’.

Graph 1 above shows how ratings were distributed across the categories. The top panel shows data for the whole set of recordings. The lower panels show the extremes of the sample – the tape where the target was (broadly speaking) most emotional in the left hand panel, and the tape where the target was (broadly speaking) least emotional in the right hand panel.

It would be quite wrong to take precise figures from the study, but it allows some key qualitative points to be made.

First, clear, outright unemotionality was strikingly rare, accounting for less than 8% of the time even in the least emotional tape; and the subcategory containing completely unequivocal instances was vanishingly rare. Those findings strongly support the intuition that emotion of some sort is a pervasive feature of life. It is quite likely that there are many kinds of situation where people would be genuinely unemotional for a higher proportion of the time than these recordings showed, but exact figures are not important. The question that matters is whether something that people intuitively regard as a kind of emotionality is the norm rather than the exception, and the data strongly suggest that it is.

Second, the study supports the intuition that the domain of emotional life includes a specific kind of state that qualifies as emotion in a special, narrower sense. The rater was guided by a definition given in Appendix 1, but it is important that the overall thrust of the instructions was to use the words in line with normal, everyday use. That is to say, it is a feature of the way people usually use the word emotion that they recognise a narrow sense, to describe something that appears to be present about 20% of the time or less in this data.

Third, obvious though it may be, it is worth stating explicitly that the data underscore the context-dependence of emotion frequencies. The lower panels indicate that the proportion of time when the subject was judged to show emotion in the strong sense ranged from over 50% in one tape to virtually zero in others. Similarly, the proportion of time when the subject was judged to show no emotion ranged from nearly 10% in one tape to zero in others. The variation reflects the fact that emotion is inseparably bound up with response to the environment, and its statistical distribution is a function of environment as well as organism. Hence, although it is probably possible to give order of magnitude estimates of emotion frequencies without a deep analysis of the role of context, to expect higher levels of accuracy would be to misunderstand the topic.

Fourth, with due allowances for context, people do appear to spend a great deal of time in a state which is neither wholly emotional nor emotional in the strong narrow sense. That is, of course, the situation that is assumed in the quote from the HUMAINE technical annex. The data shown here support the assumption.

Evidence like the Castaway study led to an effort within HUMAINE to develop terms that make the relevant distinctions easily and reliably. The phrase ‘emergent emotion’ has been chosen to describe emotion in the string sense. It is contrasted with ‘pervasive emotion’, which is what distinguishes most of life from the relatively rare cases when a person can be described as truly unemotional.

Although the findings are not surprising, they raise a difficulty that shapes the rest of this report. There is a literature on the prevalence of emotion, but the patterns it reveals most clearly tend to be mainly concerned with emergent emotion. As a result, a good deal of work appears to be needed on the prevalence of pervasive emotion. Later sections report studies that take up the challenge.

2.1 Coda: 'emotion', 'affect', 'feeling', and intuitive boundaries

There is an intriguing semantic problem bound up with the issues discussed here. Asking a non-psychologist whether someone is truly unemotional is a way to address an interesting kind of question. The word acts, so to speak, as a pointer to a boundary that people intuitively feel is significant. – a lower boundary, beneath which certain important systems are not materially influencing what the person thinks or does.

That boundary is not accessed in the same way by the other words that are in some senses alternatives to 'emotion'. Certainly the word 'affect' cannot be used in the same way. People in general cannot say whether or not their current state has an affective component. If they are asked, the most likely response will be to ask for a definition of affect – which is to say that they can only reflect back to the investigator, more or less accurately, a boundary that he or she has already defined. If people are asked whether they have any feeling, they are likely to assume that the person who is asking is an anaesthetist, because the lower boundary associated with the word 'feeling' is very low indeed.

Curiously, the rather antiquated word 'passion' is arguably an exception. To say that someone is dispassionate can mean something quite similar to saying that he or she is devoid of emotion. It is an interesting aside that Augustine (in the 'City of God' XIV9) uses the Latin root of the word, *passio*, to identify what seems to be a lower boundary rather like the one identified now by 'unemotional'. He claims that people in this world never wholly attain *impassibilitas* - freedom from *passio*.

The important issues in this area are not to do with words. They are to do with the way people understand their experience and subdivide it. It does seem that people, ancient and modern, feel that there is a significant boundary between (rare) states where reason reigns utterly uncontested, and the rest of life. It is a substantial issue for research to find ways of distinguishing states that lie on one side of that boundary from states that lie on the other. Practically, a key part of the solution must be finding terms that direct people most reliably towards the right boundary. In the English language as it currently stands, terms derived from 'emotion' are the only ones that can achieve that.

3 The prevalence of emergent emotion.

There is a good deal of literature on the prevalence of specific emotions, but its concerns are not always directly relevant to emotion-oriented computing (e.g. Carstensen, Pasupathi, Mayr, & Nesselrode 2000; Fisher 2000; Bolger., Davis & Rafaeli 2003). It may be concerned with emotional disorders, or the way the balance of emotional life (usually positive or negative) affects or is affected by other characteristics of the person or the situation. These things are important, but they do not answer very simple questions that are important for emotion-oriented computing – such as, roughly how much of life is actually affected by emotion, and of what general kind?

A good starting point is the study recently reported by Scherer, Wranik, Sangsue, Tran and Scherer (2004). The team sent questionnaires to an approximately representative sample of almost 9,000 German- and French-speaking Swiss adults. Participants were asked to report an emotional event that happened the previous day. The instructions were as follows:

Please recall the day of yesterday and describe, in as much detail as possible, an event that caused you to experience an emotion. (Important: Please focus only on yesterday. Make sure you write down one situation or event, even if your emotional reaction was weak.)

Table 1 below summarises the resulting data. Fuller information is given in the paper, particularly about blends. It is worth mentioning here that blends made up just over 20% of the total reports, in contrast to 70% which were classified as pure.

TABLE 1 Frequency of relatively pure emotions from Scherer et al (2004)

	Total (pure or in a blend)	Number of pure cases	% of pure cases
Happiness	152	94	9.1
Anger	145	89	8.6
Anxiety	99	67	6.5
Joy	91	53	5.1
Sadness	90	55	5.3
Frustration/disappointment	67	41	4.0
Stress	63	46	4.5
Despair	62	43	4.2
Contentment	57	27	2.6
Irritation	42	31	3.0
General negative	38	35	3.4
General positive	28	25	2.4
Compassion	25	14	1.4
Pleasure/enjoyment	22	16	1.6
Pride	21	9	0.9

Fear	21	12	1.2
Stupefaction	21	13	1.3
Surprise	20	10	1.0
Guilt	17	7	0.7
Relaxation/serenity	17	8	0.8
Relief	14	6	0.6
Love	11	8	0.8
Amusement	11	8	0.8
Gratitude	10	5	0.5
Hate	8	2	0.2
Interest	7	5	0.5
Disgust	6	3	0.3
Longing	6	5	0.5
Being touched	6	4	0.4
Admiration/awe	5	2	0.2
Dissatisfaction	5	3	0.3
Hope	4	1	0.1
Neutral	4	4	0.4
Jealousy	3	2	0.2
Boredom	2	1	0.1
Envy	2	1	0.1
Shame	2	1	0.1
Contempt	2	0	0.0
Subtotal pure emotions	1206	756	73.4

The method used in the study presupposes that the frequency of emotion in the relevant sense is low – not often more than once per day (otherwise the data would only convey how likely people were to select a particular kind of episode from the many that had occurred the previous day). Scherer et al argue that the data support the assumption, and that the low return rate reflects the fact that many people had no relevant episode to report. If the argument is granted, then the implication is that emergent emotional episodes of any sort occur about once in two days, and an episode of the commonest emotions - happiness, anger, anxiety – would be likely to occur once in twenty days or less.

Numbers like that clearly do not support the kind of claim that was made at the start of this report, that emotion pervades human life. That is significant for technology: it would arguably be difficult

to justify a technology concerned with episodes as rare as that. However, there are very different estimates in the literature

Myrtek and colleagues (Myrtek et al. 2001, Myrtek 2004) report a study that is satisfyingly straightforward. 50 female and 50 male students were monitored over the course of a day. Every 10 to 20 minutes, participants received a signal that asked them to indicate if they were experiencing happiness, anger, anxiety/fear, sadness, surprise, disgust or ‘‘no emotion’’ at that particular moment (only one option could be chosen). Women reported feeling an emotion about 40 percent of the time and men about 30 percent of the time.

Studies by Perrez and his colleagues produced figures that are similar to those of Myrtek in some respects, but offer a more detailed picture (1998a, 1998b: reported in Wilhelm, Schoebi, and Perrez (2004)). They reported an ‘ambulatory’ study, in which they asked 96 mothers, 81 fathers and 162 adolescents from 96 families to report their current mood and feelings, and to answer additional questions 7 times a day over the course of one week, resulting in 15,907 single reports. Respondents chose from a list of items which best corresponded to their actual state: Table 2 shows the items.

Table 2 Main results reported by Wilhelm, Schoebi, and Perrez (2004).

	% observations per person	% persons per day
Happy	28.3	62.8
Proud	5.3	19.1
Angry, furious, irritated	3.5	19.1
Sad, depressed, discouraged	3.1	14.5
Anxious, fearful, uncertain	2.8	11.6
Ashamed, inhibited	0.5	3.3
Feeling sensitive or hurt	1.6	9
Tense, rushed, or nervous	12.4	46.3
Unsatisfied	5.4	25.4
Other positive feelings	2.9	12.4
Other negative feelings	1.3	6.3
Positive feelings	28.3	65.4
Negative feelings	19.6	63
Mixed feelings	3.8	16
No feelings	47.9	9.8

Superficially, the studies that have been described seem quite at odds. However, it seems possible to put together a picture that explains why, and gives credible answers to some key questions about prevalence.

Consider first terms that clearly apply to emotions in a strong sense (emergent emotion in the sense described above, or something close to it). In the Perrez data, the relevant items are happiness, pride, anger, sadness, anxiety and shame. Apart from happiness, they are all uncommon, and each might be expected to occur one day in five or less. Excluding happiness (the reason is given below), the frequency of the states taken together is not unlike the frequency of outright emotion reported in the Castaway study.

The Scherer estimates are lower, but there are good reasons why that might be – some more interesting, some less so. The less interesting reasons involve context (discussed earlier), memory, and procedure. It has to be assumed that people forget minor emotional episodes in the course of a day. The procedure also precludes reporting of episodes that occurred on the same day as one that was reported. The more interesting reasons hinge on meaning. The Scherer procedure requires informants to describe “an event that caused you to experience an emotion”. States that had no such antecedents would therefore not be eligible for reporting in the Scherer procedure, but they would be in the Perrez procedure. It seems very likely that the large discrepancy in the case of happiness is linked to that. That would suggest mood-like happiness – a global state with no particular cause – accounted for a large part of what appears as emotion in the Perrez data.

If that is granted as credible, it suggests order of magnitude estimates for the prevalence of the common, named emotions. Very probably people experience situations that trigger at least one of the commoner forms – happiness, anger, sadness, anxiety – on the order of once a day. Other emotions that are conceptually salient – hate, disgust, awe, jealousy, envy, shame, contempt – are much less common, and unlikely to occur in the course of a standard day. Taking the castaway and the Perrez data together, it seems possible that people spend around 20% of their time in one of these states.

It must be emphasised that these estimates are very rough. Above all, they are dogged by definitional problems. The numbers depend on what participants counted as an emotion. Everyday language leaves a great deal of leeway in what they count, and the context is likely to shift the thresholds that they set in non-obvious ways.

The issue of shifting thresholds is even more marked at the other extreme. The Castaway study suggests that it is rare to be unemotional; the Perrez and Myrtek studies, that it makes up about half of life; and Scherer et al that it is very much the norm. The issue is reasonably clear with Scherer et al: their focus is on well-defined episodes with definite eliciting conditions, and it is clear that people are not usually in that state. The other studies are subtler.

On the surface, the Myrtek and Perrez figures contrast sharply with the Castaway study. The latter suggests that people spend less than 10% of their time in a truly unemotional state: the Myrtek and Perrez studies give figures of 50% or more. However, looking at the response categories in context, it is very likely that participants took the null terms to mean different things in the different studies. In the ambulatory studies, it would be surprising if the meaning of the term ‘no emotion’ did not shift quite strongly towards “none of the above” – or perhaps, more subtly, towards “nothing of the kind mentioned above, assuming that is what you mean by ‘emotion’”. That has the merit that it would explain the difference between the two studies. Evidence to be presented later strengthens that interpretation.

There remains a range of states that are neither emotion in a strong sense, nor unemotional. The Myrtek et al procedure gives no way to gauge how common they are. Happiness, sadness and anxiety in particular need not describe emergent emotions – they could equally well describe moods or mood-like states. The Perrez et al categories include a considerable number – discouraged, uncertain, inhibited, sensitive or hurt, tense, rushed, nervous, unsatisfied – which at least do not obviously qualify as emotions in a strong sense; and it has already been noted that happiness may refer to moods rather than emergent emotional states. It is not possible to tell how much of the time respondents spent in those moods or mood-like states, but it seems to unlikely to have been less than they spent in the more archetypally emotional states; and it could easily have been much more.

Looking closely at studies like these brings out a methodological issue. To make prevalence estimates, one needs pointers that identify the relevant kind of state reasonably unequivocally. Some everyday emotion words do that, but not very many. Describing the circumstances that gave rise to an emotion can also point to its identity quite sharply, as the Scherer group recognised. However, these resources between them deal with rather a small part of emotional life, of which emergent emotion makes up a large part.

If emotion of some sort is as pervasive as the Castaway study suggests, most of it is frustratingly elusive, in the sense that not very many reliable pointers are available to identify the parts that make it up. The task depends on constructing tools that are suited to the task. The work reported in the next section took up that challenge.

4 Estimating the prevalence of pervasive emotion.

This section is concerned with obtaining prevalence estimates for the whole range of states that involve emotion of any kind. The task is bound up with finding ways to describe the states for which there are no readily available terms.

The starting point was a reasonably standard list distinguishing broad types of state that involve affect: emergent emotion, mood, attitude, and interpersonal stance. Many states are quite difficult to classify into that framework as it stands, and so it was extended, taking account of descriptions in the literature that seem to refer to other types of state; work with databases, which provided examples that were difficult to classify in that framework; and theory which suggested that other possibilities ought to be considered. Two phases of research followed.

4.1 O'Neil's study

A combination of theory, personal experience, and discussion with other people led to a preliminary version of an extended list. The expansions were initially in four main areas.

1. Variants of emergent emotion. The term 'fullblown emotion' was reserved for the archetypal example of an emergent emotion, where the emotion runs unchecked (following Scherer and Cowie and Cornelius). 'Suppressed emotion' was used for the case where the inner state is characterised by the kind of synchrony that Scherer describes, but its outward expression is deliberately controlled. 'Simmering emotion' was used for the case where some of the processes that Scherer describes are active, but they are not fully synchronised (and may or may not reach that point).
2. Variants of mood The term mood was reserved for states which, as in the classical definition, do not have an object. Empirically there seem to be states which are long lasting like moods, and which people may call moods, but which 'lock on' temporarily to one object after another. These were named 'topic shifting' emotions (lay users were less comfortable with an earlier name, 'flitting').
3. Established emotion The philosophical literature in particular is much concerned with states such as grief or shame, which are part of a person's makeup for a long time, and come to the fore in acute episodes (often because of a relevant trigger). The term 'established emotions' was introduced to describe these enduring states.
4. Dimension-related states A good deal of emotion-related variation seems to involve affective dimensions other than valence – how aroused a person is, whether they feel in or out of control, how seriously they take things going on around them. It is not particularly easy to express these issues in a taxonomic framework, but users seemed reasonably comfortable describing them as altered states of arousal, control, and seriousness respectively.

Pilot studies presented early versions of the list both to people involved in emotion research, and to members of the public. On that basis, the categories were refined by removing categories that people found difficult to understand or to distinguish from others, and by adding categories to cover experiences that informants felt were part of emotional life, and that seemed not to belong to any of the available types.

When the list appeared to be reasonably stable, it was tested empirically to verify whether the categories, new and old, made sense to lay people; were common enough to be of interest; and were felt to be practically important. Descriptions of each category (including a supporting example) were carefully framed to be understood by non-experts. They are given in Table 3.

Table 3: generic categories used in the O’Neil study, showing definitions designed to be understood by lay participants, followed by examples drawn from the pilot studies.

<p>1) Attitudes</p>	<p>This refers to long-lasting positive or negative orientations towards things or people, which are more or less permanently part of the way you interact with them or think about them. They may just be positive or negative, or subtler.</p> <p>Example</p> <p>“I have a long lasting attitude towards nature, It never ceases to amaze me, I look at it is as being beautiful”</p>
<p>2) Established emotion</p>	<p>This refers to long-standing states that influence a person’s emotional life over weeks or years. They are linked to some person or situation that has relatively intense significance for the person. They tend to be in the background for most of the time, but they can be ‘triggered’ in a way that produces surges of overt emotion.</p> <p>Example</p> <p>“Sadness over the death of a colleague, comes through in discussion among friends remembering happier times”</p>
<p>3) Emergent emotion (full-blown)</p>	<p>This refers to states where the person’s whole system is caught up in the way they react to a particular person or situation – which may be in reality or in their mind.</p> <ul style="list-style-type: none"> – it involves distinctive positive or negative feelings about the people or situations involved – it involves impulses to act or express yourself in particular ways and avoid others – it involves distinctive changes in your body, for instance in your heart rate or tendency to sweat – it doesn’t usually last very long – it comes on quite quickly, and dies down reasonably soon (unless there is something very unusual happening) <p>Example</p> <p>“Fear – noise in the house at night – heart rate increased – immediately think of worst – someone in house”</p>
<p>4) Emergent emotion (suppressed)</p>	<p>This refers to states where the person’s inner feelings are like a full-blown emotion, but they are kept under control by a deliberate effort not to let them take over or show to other people.</p> <p>Example</p> <p>“Picking up brother and his friend. I took a wrong turn & friend called me an idiot. Wanted to shout back but knew it would be too much trouble so decided to bite tongue instead.”</p>

<p>5) Moods</p>	<p>This refers to states where a person’s whole outlook is ‘coloured’ by a particular kind of feeling, but it is not focused on any particular thing or event – it is just how the person feels in him- or herself. These states tend to be moderately long lasting (hours or days).</p> <p>Example</p> <p>“Depressed – no real reason, but felt down, not in mood to speak to anyone, felt everything was wrong.”</p>
<p>6) Partial emotion (topic shifting)</p>	<p>This refers to states between a mood and an emergent emotion, where a person is in a single kind of emotional state, but it is not fixed on a single thing or issue – instead the emotion attaches to one object, then another, then another, in quite rapid succession.</p> <p>Example</p> <p>“Angry and tired from previous day. Getting annoyed when styling hair because it wouldn’t stay. Angry at dog trying to get out, and things at work.”</p>
<p>7) Partial emotion (simmering)</p>	<p>This refers to states where a person experiences some of the elements of an emergent emotion, but they have not come together to form the kind of emotional state that takes control of a person’s thoughts and feelings.</p> <p>Example</p> <p>“A steward on our plane found a passenger using a mobile phone. She kept arguing and he was polite but his face coloured as if he could easily tip over the edge and get angry with her.”</p>
<p>8) Interpersonal Stances</p>	<p>This refers to relatively short-lived states where feelings towards another person come to the fore and incline you to behave in a particular way towards him or her.</p> <p>Example</p> <p>“Supportive, felt protective towards someone”</p>
<p>9) Altered state of arousal</p>	<p>This refers to states whose main feature is that your energy levels feel different from usual. It could be mental or physical energy or both. Examples are energetic, drowsy, dull, alert, withdrawn.</p> <p>Example</p> <p>“Exam time. State of alert & energy dramatically increased – regardless of how little sleep I had.”</p>
<p>10) Altered state of control</p>	<p>This refers to states whose main feature is that you feel either more in control of things than you usually do, or less in control. Various other kinds of feeling may be linked to the sense of control, e.g. positive or negative feelings.</p>

	<p>Example</p> <p>“Worried, panicky, frustrated at being let down at last minute by someone I was relying on.”</p>
11) Altered state of seriousness	<p>This refers to states where you take things more seriously than usual of less seriously than usual.</p> <p>Example</p> <p>“Tidying my room and fussing about where I ought to put an old souvenir when I suddenly realised it was totally ridiculous and had a good laugh at it all.”</p>

The developed list was tested with 50 participants from a local community (O’Neil 2006). They were deliberately not University staff or students. Participants read through the whole list, and were free to ask questions if they chose. They were asked to go back to the categories one by one, and to answer the following questions for each one:

How clear did you find the definition?

How important is this kind of state to you?

When did you last experience a state of this kind?

Could you describe that experience briefly in your own words?

Figure 2 shows the main numerical results. In summary:

- Subjective ratings indicate that the definitions were generally understood. Attitude, topic shifting and simmering were the only cases where there were many real uncertainties, and even there a clear majority did understand.
- In terms of significance, the classical focus of research, fullblown emotion, was rated least important, with mood, attitude and established emotion most important.
- Frequency shows a related picture: attitude and mood had on average been experienced most recently, fullblown emotion least.

These findings give encouragement to the approach, but they are very much preliminary. Two main areas for development stand out.

First, participants provided descriptions of the experiences on which their ratings were based. These were analysed by independent raters, first to identify how well they fitted the intended categories, and second, whether some appeared to call for new categories. As a result, the table of categories was revised to take account of difficulties in the first version.

Some of the revisions were a matter of nomenclature, but some were more significant. The term ‘attitude’ was clearly not understood in the way that was intended. Clearly in contemporary speech it has acquired meanings that are entrenched, and much more specific than this kind of study requires. However, the concept of stance seems to extend naturally to cover the gap that is left by the shift in the meaning of attitude. There were also numerous descriptions of orientations to people which were not well captured by any of the available terms – they were too enduring to be described as stances, but too steady to be described as established emotions. ‘Bond’ seemed acceptable as an alternative.

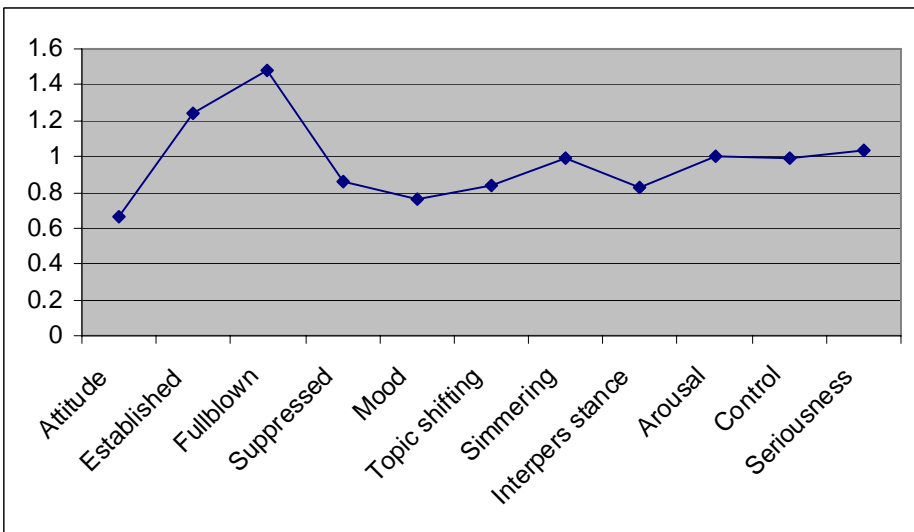
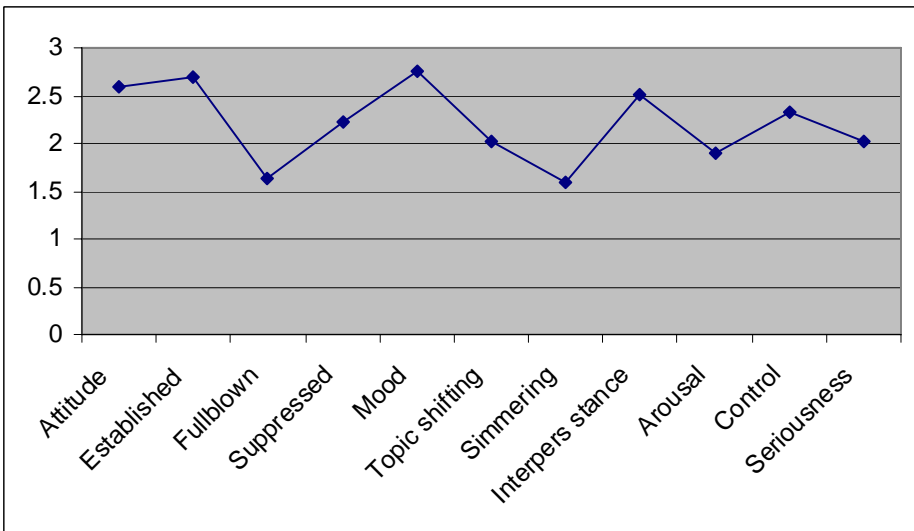
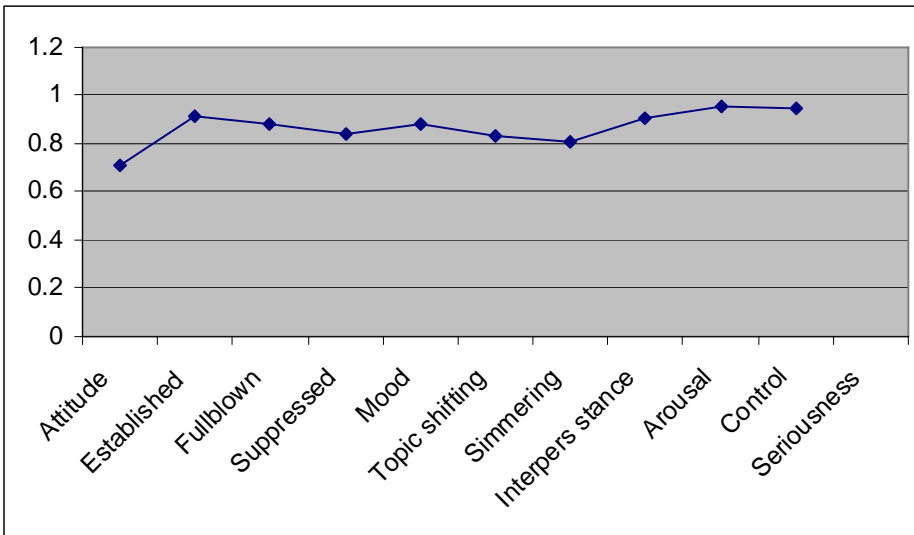


Figure 2: main results of O’Neil study. Panel A shows the proportion rating clarity of each state description good or very good; Panel B shows how important each state was rated (4=’basic to the way I am’); Panel C shows time since the last experience in that category (on a logarithmic scale, 1=10 days, 2=100 days, etc).

Second, the estimates of time since an emotion-related experience are clearly not reliable. For most categories, the average time since the reported event was about a week. Given the number of categories, that would suggest that only one or two events in any of the categories occurs in a day. In one sense, that is much lower than would be expected from the data reported in the previous section. On the hand, it is quite consistent with the previous section to assume that most of emotional life is forgotten quickly: only relatively striking examples stay in memory for very long. As a result, an ambulatory study was carried out using the revised table.

4.2 Belfast Ambulatory Study

Table 4 below summarises the descriptive system resulting from the O'Neil study. It can be seen that it is cohesive as well as empirically grounded. It divides into three main regions, which overlap. The states from established emotion to transitional can be grouped as emotion-like; the states from transitional to altered state of engagement as mood-like; and the states from altered state of engagement to interpersonal bond as stance-like.

Table 4 Revised descriptive system used in the ambulatory study

	Persist- ence	Type of condition	Directed towards	Affective dimensions involved	Relation to analytic thought
Established Emotion	Long term	disposition	a particular thing	all when expressed	highly variable
Emergent Emotion (suppressed)	Short term	impulse	a particular thing	all	tension
Emergent emotion (full-blown)	Short term	impulse	a particular thing	all	dominates
Transitional between mood-like and emergent	Medium term	Swings between felt evaluation & impulse	random things	valence ↔ all	varies
Mood	Medium term	felt evaluation	things in general	valence	colours
Altered state of (felt) control	Medium term	felt evaluation	own potency	control	colours
Altered state of arousal	Medium term	disposition	take or avoid action	arousal	colours
Altered state of engagement	Medium term	felt evaluation	significance of things	caring	colours

Stance towards object/situation	Short term	disposition	a particular thing	open	integrates
Interpersonal stance	Short term	disposition	a particular person	open	integrates
Interpersonal bond	Long term	disposition	a particular person	open	unspecified
Emotionless	Short term			none	no impact

Ten participants were given a protocol in which each generic category was named, described using the wording in Table 3 with some minor adjustments, and illustrated with an example given by a participant in the previous study. Each of the participants was then contacted by phone 50 times at random times over a period of weeks. They responded to each call by identifying the generic descriptor that best reflected their state at the time. The main results are summarised in Table 5 below.

Table 5 Proportion of reports involving each category used in the ambulatory study

Established Emotion	0.9%
Emergent Emotion (suppressed)	1.7%
Emergent Emotion (full-blown)	1.5%
Mood/emergent emotion oscillation	1.5%
Mood	36.1%
Stance towards object/situation	25.6%
Interpersonal Stances	2.4%
Interpersonal Bonds	4.1%
Altered State of Arousal	21.9%
Altered State of Control	3.9%
Altered State of Engagement	0.4%
Emotionless	0.0%
None of the above	0.0%

It is a reassuring feature of the data that they are broadly compatible with the data from the Perrez group. If we assume that the reports of happiness in the Perrez studies are mostly mood-like, then mood probably the largest category in both studies. 'Tense, rushed, nervous' in the Perrez data probably corresponds with 'altered state of arousal' here: both make up another large category. The

various senses of emotion account for about 6% of the Belfast ambulatory data, and perhaps more like 10% of the Perrez data (it depends how much of the relevant categories is mood-like).

The most striking difference is that many of the Belfast reports describe stances, and very few describe states classified as unemotional; whereas the Perrez participants describe their states as unemotional, but there is no obvious way for them to report states that the Belfast informants classified as stances. The obvious assumption is that the difference reflects the kind of threshold problem that was discussed earlier: what is described as an emotionally coloured stance in the context of one descriptive framework will be described as unemotional in another.

It is perhaps surprising that the Castaway data, with a methodology that is very different, and in some ways much less credible, also gives broadly comparable estimates. It suggests more emotion in a strong sense than the Belfast Ambulatory study, but not grossly so; and also more outright unemotionality, but not grossly so.

It would be too much to claim strong convergence. However, it does seem fair to claim that a very broad picture of emotional life seems likely to be true. By and large, people are not likely to be truly unemotional very often; they are more likely to be truly emotional, though still not very likely. What is most likely is that they will be in a state between those two extremes.

5 Conclusion: the pervasiveness of emotion

It is frustratingly difficult to confirm or refute the intuition that “emotion in the broad sense pervades human communication and cognition”. The reason is bound up with the fluidity of the terms that are used to describe emotion-related phenomena in everyday language, and to some extent with the vagaries of memory, which seems not to retain much information about moderate emotional states for long. Over and above that, context enforces a high level of variation.

Nevertheless, it seems reasonable to conclude from the data that emotion is a pervasive feature of human life – not emotion in the strong sense (‘emergent emotion’), but emotion in the sense of states that people would not ordinarily describe as free from any influence of emotion.

It is not easy to describe the states that involve emotion in that sense. It is particularly not easy to describe them in ways that will be understood by people who are not already immersed in the psychology of emotion, and those are the people who need to be engaged to obtain credible prevalence estimates. A large part of the work reported here has gone into establishing descriptions that they find reasonably intelligible. The scheme set out in Tables 3, 4 and 5 here conveys its main points.

Broadly speaking, what pervades seems to involve moods – medium term dispositions to evaluate anything and everything more or less positively; stances – short-term states where a person’s outlook on an object or situation involves various emotion-related themes; and medium-term dispositions to be more or less active. On the next level, and far less common, are bonds – deep seated enduring dispositions to react to and feel towards particular people in particular ways; and states where the person feels more or less than usually in control of what is happening.

If prevalence is an issue for emotion-oriented computing, it would appear that these are the kinds of state that it has most cause to consider. Full-blown emotion, which may occur perhaps once a day or less, is salient in our mental representations of emotional life; but, like many other salient phenomena, not common.

6 References

- Augustine *City of God* tr H Bettenson (1984) London: Penguin Classics
- Bolger, N., Davis, A. and Rafaeli, E. (2003) Diary Methods: Capturing Life As It Is Lived, *Annual Review of Psychology* 54: 579–616.
- Carstensen, L; Pasupathi, M; Mayr, U; Nesselroade, J. R. (2000) Emotional Experience in Everyday Life Across the Adult Life Span *Journal of Personality and Social Psychology* Volume 79(4), p 644–655
- Fisher C D. (2000) Mood and Emotions while Working: Missing Pieces of Job Satisfaction? *Journal of Organizational Behavior*, Vol. 21, No. 2, Special Issue: Emotions in Organization pp. 185-202.
- Myrtek, M. (2004) *Heart and Emotion. Ambulatory Monitoring Studies in Everyday Life*. Gottingen: Hogrefe and Huber.
- Myrtek, M., Zanda, D. and Aschenbrenner, E. (2001) ‘‘Interactive Psychophysiological Monitoring of Emotions in Students’ Everyday Life. A Replication Study’’, in J. Fahrenberg and M. Myrtek (eds) *Progress in Ambulatory Assessment: Computer-Assisted Psychological and Psychophysiological Methods in Monitoring and Field Studies*, pp. 415–34. Kirkland, WA: Hogrefe and Huber.
- O’Neill, C (2006) Emotional life: The frequencies and importance of emotion-related states. Unpublished BSc Thesis, Psychology, QUB
- Perrez, M., Berger, R. and Wilhelm, P. (1998a) ‘‘Die Erfassung von Belastungserleben und Belastungsverarbeitung in der Familie: Self-Monitoring als neuer Ansatz’’ [Assessment of Stress and Coping in the Family: Self-Monitoring As a New Approach], *Psychologie in Erziehung und Unterricht* 45(1): 19–35.
- Perrez, M., Wilhelm, P., Berger, R., Horner, M., Law, I., Schoebi, D. and Zbinden, M. (1998b) Belastungserleben und Belastungsverarbeitung in Familien mit Adoleszenten. Forschungsbericht [Experiencing Stress and Coping with Stress in Families with Adolescents. *Internal Research Report*], No 133. Freiburg: Psychologisches Institut, Universitat Freiburg.
- Scherer, K. R. Wranik, T., Sangsue, J., Tran, V. & Scherer U. (2004) Emotions in everyday life: probability of occurrence, risk factors, appraisal and reaction patterns *Social Science Information* 43; pp. 499 -
- Walsh, R. (2007) An examination of the forms and frequency of pervasive emotion. Unpublished BSc Thesis, Psychology, QUB
- Wilson V (2007) Capturing the complexity of emotional life: Via experience sampling methodology Unpublished BSc Thesis, Psychology, QUB
- Wilhelm, P & Perrez, M. (2004) How is my partner feeling in different daily-life settings? *Social Indicators Research* 67, 183-246.
- Wilhelm, P., Schoebi, D. & Perrez, M. (2004). Frequency estimates of emotions in everyday life from a diary method’s perspective: a comment on Scherer et al.’s survey-study ‘‘Emotions in everyday life’’. *Social Science Information*, 43(4), 647-665

Appendix: Instructions to the rater in the Castaway study

This experiment is about the categories people naturally use to describe emotion. The categories we are interested in are emotion in the full sense of the word, no emotion at all, and everything else in between.

We are assuming that people have categories like that in their heads already. The way people use the words means they have some sense of there being some states you can call emotion in a strong sense, and other states that might involve a bit of emotion, but aren't really emotion in the full sense of the word; and at the other end they feel there some states you can call completely emotionless whereas others have some tints of emotion here or there even if they are not very strong. The main aim of the experiment is to find out where people naturally draw the lines between those kinds of state.

That means it is quite a delicate business giving instructions. We would be shooting ourselves in the foot if we gave you instructions that told you exactly where to draw the line between one type of state and another. But do need to make sure you have the right distinctions in mind. So we will give you descriptions that you should recognise if you are thinking of the right categories.

So far as we are concerned, an emotion in the full sense of the word is a state where the person's whole system is caught up in the way they react to some person or situation – which may be in reality or in their mind.

- it involves distinctive positive or negative feelings about the people or situations involved
 - it involves impulses to act or express yourself in particular ways and avoid others
 - so even if you control the impulses it takes an effort
 - it involves distinctive changes in your body, for instance in your heart rate or tending to sweat
 - it doesn't usually last very long – it comes on quite quickly, and dies down reasonably soon (unless there is something very unusual happening)
-
- Do you recognize the kind of state we are talking about?
 - Can you get an image of that kind of state in your mind?
 - Do you agree that that kind of state definitely qualifies to be called an emotion?
 - Do you agree that with other kinds of state, there is a bit of uncertainty whether you would call it an emotion or not?
 - If not, do you find it easy enough to go along with what we calling emotion in the full sense?
 - Your task will involve judging when a person you are watching is in that state (that we call emotion in the full sense), and when they are not
 - At least so far as you can tell. You may not be completely sure, but that's another matter.
 - Are you reasonably sure you understand that bit of the task?

Let's go to the other end now.

So far as we are concerned, completely emotionless means the way a person is thinking and behaving is completely cool and logical – there are no traces of emotion in their thought and behaviour at all, either on the surface or in the background.

- Do you recognize the kind of state we are talking about?
- Can you get an image of that kind of state in your mind?
- Do you agree that that kind of state definitely qualifies to be called emotionless?
- Your task will involve judging when a person you are watching is in that state and when they are not
 - o again, so far as you can tell: you may not be completely sure, but that's another matter.
- Are you reasonably sure you understand that part of the task?

Partial emotion is basically everything in between the other two. It means a person's thought and behaviour have emotional elements in them or they are coloured by emotion, or there is an undercurrent of emotion, but you don't have the whole pattern together in the way you do with emotion proper.

Basically, if you are happy with the other two categories, that should be straightforward enough.

- Are you reasonably sure you understand that part of the task?

Then we are ready to look at the program we will use.