

# Cognitive approaches to emotions

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**Cognitive approaches offer clear links between how emotions are thought about in everyday life and how they are investigated psychologically. Cognitive researchers have focused on how emotions are caused when events or other people affect concerns and on how emotions influence processes such as reasoning, memory, and attention. Three representative cognitive theories of emotion continue to develop productively: the action-readiness theory, the core-affect theory, and the communicative theory. Some principles are common to them and divergences can be resolved by future research. Recent explanations have included how emotions structure social relationships, how they function in psychological illnesses, and how they are central to music and fiction.**

## How cognitive psychologists approach emotions

The study of emotions has recently expanded in psychology. It has extended, too, into fields that range from history to neuroscience and from literary theory to psychiatry. Intense debates now occur on definitions of emotions, on what the best measurements are, and even on whether emotions are real psychological states. These debates can make the field seem confusing. Cognitive approaches, based on the mind's organization of conscious and unconscious knowledge, offer a clarifying perspective because they focus on the fundamental issues of how emotions are caused and what their effects are.

According to cognitive approaches, emotions are important because they relate outer events and other people to inner concerns. A principle of these approaches is that an emotion is a judgment of value (Aristotle, *Rhetoric*, 1378a); for instance, that a particular event is important, that it is pleasant to be with a certain person, or that a specific concern is urgent. So an emotion is not just physical, like a sneeze. It is an evaluation, now called an 'appraisal' [1,2]. This concept is critical because, in a world that is not fully predictable [3,4], evaluation of the significance of everyday events and of people with whom one interacts makes emotions central to life.

So, if you are helping a colleague at work and someone says something derogatory, you may have an emotion. You

judge what the person says as an insult that undermines what you are doing and threatens your status (a cognitive appraisal). Neurophysiological processes prepare you for a new action, your heart pumps faster (a bodily change), you feel anger mounting within you (a subjective experience), you grimace (a facial expression), and you may say something vindictive (a new action). A typical emotion accordingly combines appraisal, physiological change, experience, expression, and action.

Not everyone accepts cognitive approaches. Some people think, as did William James, that emotions are perceptions of bodily states [5]. Others, such as Ekman, champion 'affective science' based on physiology and ethology [6]. Cognitive approaches have, however, been growing [7,8]. Here we present three cognitive theories of emotions that are developing productively. We show commonalities among them and indicate research that needs to be done in the multidisciplinary area of understanding emotions.

## Three cognitive theories of emotions

### *Action-readiness theory of emotions*

The longest standing cognitive theory of emotions that remains under active development is Frijda's action-readiness account [9–11]. Like Ortony, Clore, and Collins's componential theory [12,13], to which it is comparable, Frijda's theory holds that emotions are built from elements that are not themselves emotions. For the componential theory, these are stimulus–response pairs; for Frijda they are 'ur-emotions', states of readiness for certain kinds of action [11], each of which gives priority to a particular goal. Frijda postulates that appraisal yields pleasantness or unpleasantness, with its tendency to approach or to avoid. Such simple appraisals can be automatic and unconscious, as Clore and his colleagues have shown in experiments on priming and on how emotions can be informative [14].

States of readiness have motivational properties. They impart an urgency to establish, maintain, or modify the individual's relationship with the event or person that caused the emotion by an action intended to achieve the motivational state's aim. Different states of action readiness have different aims, generated by appraisal of which aspects of the event that elicited an emotion should be enhanced or diminished. In joy, for instance, an aim is to enhance engagement in the current situation. In fear the aim is to diminish danger.

Frijda has ranged widely in his analyses, from what it is to fall in love, to the nature of vengeance, to emotions in movies. In his account emotion is not a state but a process, and cognitions can regulate each of its phases [9,15]. An

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emotion can prepare for many kinds of action, individual and social. The readiness is all.

The theory of action readiness is based on evidence that different emotions relate both to different appraisals and to different states of readiness for kinds of action [2,11]. It has led to computational models [16], analyses of Chinese poetics [17], and cross-cultural studies [18].

### Core-affect theory of emotions

Russell [19] has proposed that underlying any emotion is core affect, a state with two dimensions: level of arousal and pleasure versus displeasure. This theory has been augmented by Barrett and other colleagues [20,21].

Core affect results from internal or external causes, but people have no introspective access to what causes it. It is a continuous 2D assessment of one's current state. It can be experienced as free floating, but it can also be attributed to an object.

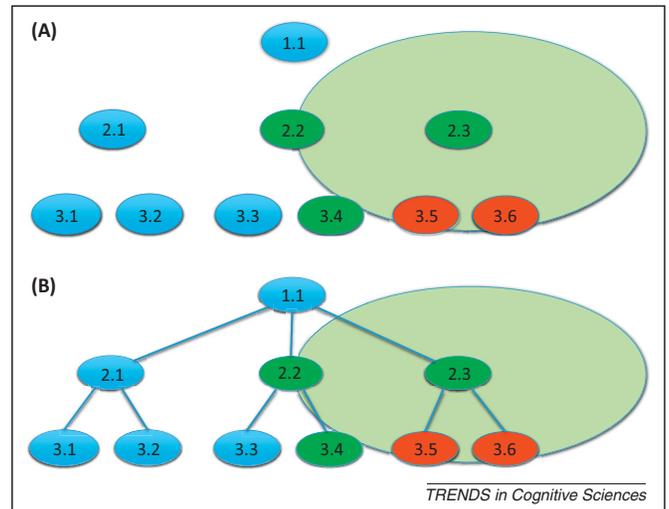
Like Schachter and Singer's theory [22], the core-affect theory postulates two stages in generating an emotion. The first is of arousal (with an added pleasure–displeasure dimension) and the second is of social construction. Like appraisal, social construction is of long standing in cognitive approaches to emotions. Following this approach, core affect prompts experience of an emotional episode constructed from social customs and cultural ideas, as a prototype of anger, fear, or suchlike. An emotion prototype comprises an event, the perception of its core-affective quality, attribution of the emotion to an object, continuing appraisal of the object, and action directed toward the object.

The intuition behind the theory of core affect is that although people talk of emotions such as anger and fear, such states are not distinct and they are not evolutionary universals. As prototypes, they overlap. Evidence includes facial expressions being less categorical than Ekman has proposed in his arguments for emotions as universals [6,23,24] and the finding that variations of emotions within a category such as fear are as wide as those across a category boundary, say between fear and anger [25]. The theory has been applied to the nature of emotional feelings [21] and neural bases of emotion [26,27].

### Communicative theory of emotions

This theory postulates that emotions are communications within the brain and among individuals [28,29]. It postulates that distinct basic emotions evolved as adaptations in social mammals [30]. Rapid appraisals of situations in relation to current goals fall into a small number of generic events, such as trains of action going well, losses, frustrations, and dangers. Appraisals are cognitive, although not necessarily conscious. They are signals that set body and mind into modes that have been shaped by evolution and individual experience to prompt a person toward certain kinds of action appropriate to the generic event and to impart urgency to these actions.

Appraisals can occur anywhere in a hierarchy of brain processes. Emotional signals and the propositional contents of their appraisals are separate communications in the brain (Figure 1). Emotional signals are basic in the sense of being evolutionary adaptations, although this proposal has been disputed [13,26]. Because basic emotions



**Figure 1.** Cognitive modules in the brain according to the communicative theory of emotions. (A) How an emotional signal spreads diffusely from one module (2.3) to turn on some modules (2.2 and 3.4) and turn off others (3.5 and 3.6). The resulting state is a distinctive mode, tuned to respond to a recurring kind of event in the environment. In the mode of the basic emotion of fear, for instance, vigilance for danger in the environment is turned on and continuance of a current plan is turned off. (B) How, in addition, propositional signals pass along specific pathways and can indicate the cause and object of the emotion. Usually these two kinds of signal combine so that a diffuse emotional signal initiates an emotion and propositional messages enable the experiencer to recognize its cause and object.

are without propositional content, their repercussions in consciousness are experiences without awareness of their causes. However, they are usually accompanied by an awareness of propositional contents about their causes and the objects to which they are directed.

Some basic emotions – happiness, sadness, anger, and fear – can occur without an object, but others necessarily have objects; these include love and hatred as well as disgust, which can be directed at substances or people [31]. Table 1 summarizes the basic emotions.

Other emotions are complex. These derive from basic emotions, but they arise from appraisals that necessarily have propositional content, usually recognized consciously, that concerns one's self (i.e., the mental model one has of one's self), which embodies one's ideals. They include jealousy, in which fear, anger, or hatred arise from an appraisal that a third person threatens a relationship, and embarrassment, in which fear of ridicule arises from an appraisal of its possibility. With complex emotions, propositional contents act as triggers and they therefore vary, with aspects being socially constructed from culture and individual development.

Emotions are also communications to others, by gestures, postures, facial expressions, and verbalizations. Emotions often produce empathy in others and they can create and maintain relationships such as happy cooperation or angry conflict.

Evidence for this theory includes reports from people who keep emotion diaries (see below). These reports show that people tend to experience emotions when events affect their goals or plans, that happiness, sadness, anger, and fear can occur without propositional content, and that such free-floating emotions comprise 6% of reported episodes [32]. The communicative theory has been applied to the semantics of emotion terms [33], to effects of emotion on

**Table 1. Basic emotions, some of which (according to the communicative theory) can be free floating although some must have known objects, along with antecedents and consequences for individual and relational action**

Emotions that can be free floating	Antecedents	Consequences
Happiness	Succeeding in goals	Continue, modifying as necessary; cooperate
Sadness	Failing in goals; loss or separation	Search for new plan; do nothing, abandon lost relationship
Anger–irritation	Obstruction to goals	Aggression, conflict with others
Fear–anxiety	Threat to self-preservation	Submit or escape, join with others in avoidance
Emotions with necessary objects	Object of emotion	Consequences
Attachment love	Caregiver	Maintain contact
Parental love	Offspring	Nurture, protect
Sexual love	Partner	Courtship, sexual activity
Hatred	Object of emotion	Treat without consideration
Disgust	Noxious entity	Expel or reject

reasoning (Box 1), to the emotional significance of fiction (Box 2), to music (Box 3), to film [34], and to psychological illnesses (see below).

### How three cognitive theories of emotion concur and differ

The three theories presented here are not the only ones being developed, but they are representative of cognitive approaches to emotions. They accept that experiential, physiological, and behavioral aspects are typical but not invariable in emotions and that measures of these aspects do not always cohere [15], so they avoid problems of whether any one measure always indicates an emotion. Clarification also occurs by seeing, as shown in Figure 2, how emotion-based states have different time courses, from a few seconds for facial expressions to minutes or hours for experiences of

emotion (a principal focus of cognitive theories), months for psychological illnesses, and lifetimes for emotion-based traits of personality. Here again no single criterion identifies all emotional states with measures that range from

#### Box 1. Emotions can enhance reasoning

Humans are rational – otherwise science, mathematics, and even survival in daily life would be at risk – and they enjoy exercising their inferential ability [61]. But they also err, and a common belief is that emotions impair reasoning. Certainly, a person in a panic attack is not a paragon of inferential competence. A crucial distinction, however, is whether an emotion is incidental to a reasoning task or emerges naturally from it [62,63]. When an emotion arises from the task, a recent hypothesis is that reasoners are more motivated and more likely to consider possibilities that they would otherwise neglect [56]. In one study, participants were asked to remember an episode in their life in which they had felt guilty. The memory induced the emotion, which enabled them to deduce more possibilities consistent with a premise than did a control group. The effect occurred only when they reasoned about a scenario concerning guilt. Emotions can similarly reduce the erroneous tendency to confuse the truth of a conclusion with the validity of its inference [51,64,65].

Blanchette and her colleagues have demonstrated effects on reasoning of emotions elicited in real life. British war veterans with post-traumatic stress disorder evaluated deductions about war better than deductions about neutral topics [66]. Likewise, after the terrorist attacks in London, UK on 7 July 2005, the nearer participants were to the attacks, the greater the proportion who correctly evaluated deductions concerning terrorism; those in London were more accurate than those in Manchester, UK, who in turn were more accurate than those in London, Ontario, Canada [67]. The difference between the Mancunians and Canadians had disappeared 6 months later, but the UK Londoners still reasoned more accurately about terrorism than the other groups. The three groups differed appropriately in the intensity of their emotions, so the effect depended on emotions. Not all studies show an enhancing effect of emotion, and extraneous emotions do not help, but other factors may matter: contents evoking negative emotions may have low utility because the situations they evoke are undesirable [68].

#### Box 2. Literature can enhance emotions and empathy

From the earliest surviving written stories to the present, literature has focused on emotions. These emotions are not just those of literary characters; more importantly, they are our own. Although fiction elicits other emotional processes [69,70], its main process is identification. In this case, the principle of metaphor – in which one thing can be something else – is extended: we can be our own selves and we can be Achilles or Anna Karenina. In a process of mental simulation [71,72], we put aside our day-to-day concerns and insert the protagonists' goals into our own planning processors – we take on their intentions as our own – and experience emotions related to what happens in the story. The emotions are empathetic [73] and studies corroborate the communicative theory's focus on goals and interpersonal relations. By way of empathy, happiness tends to prompt happiness, anger to prompt anger, sadness to prompt sadness, and fear to prompt fear.

In the first studies of this issue, the amount of fiction and nonfiction that people read was measured. Then, using the Mind in the Eyes Test [74] see Figure 1, it was found that the more fiction people read, the better were their empathy and understanding of others [75], but the effect did not occur with reading nonfiction. Subsequently, experiments have shown that reading fiction as compared with nonfiction caused increases in empathy and understanding of others as measured by the Mind in the Eyes Test [76] and by questionnaire [77]. Also, when people read artistic literature, their personalities changed by small amounts, and not all the same direction as with persuasion, but for different people in their own ways. The size of the change depended on the amount of emotion the participants experienced during reading [78].



TRENDS in Cognitive Sciences

**Figure 1.** An item from Baron-Cohen *et al.*'s 36-item Mind in the Eyes Test. This test measures empathy and the understanding of others' minds. Participants have to choose, for each item, one of four terms by which to interpret what the person in the photograph is feeling and thinking. For this item the terms are 'reflective' (correct), 'aghast', 'irritated', and 'impatient'. Compared with readers of nonfiction, people who read fiction – with its subject matter of intentions and emotions in the social world – scored higher on this test both in long-term associations [75] and in experiments [76]. Reproduced with permission from Figure 2 in [74].

### Box 3. Music can create basic emotions

Stories can evoke real emotions about unreal events. You can laugh or weep about what you know are fictions. Music is more puzzling, because it can move you even if it refers to nothing; the music is not so much the object of your emotion as its cause. Most listeners can tell that different pieces of music communicate different emotions even if they do not experience these emotions on listening to the music [79]. Yet, for over a century, psychologists have shown that listeners report that music creates real emotions in them [33,80]. Brain-imaging studies confirm this conclusion [81–83].

Music often has extra-musical associations, and listeners can project different interpretations on the same piece of music. These two phenomena lead to the view that music can communicate emotions that have an object, such as love, and emotions that are complex, such as nostalgia. By contrast, the communicative theory implies that music can convey only basic emotions with no objects (see Table 1 in main text). The great 19th century critic Eduard Hanslick made a similar argument, and evidence corroborates it [84–86]. Even the Mafa in Cameroon, who had never heard Western music, recognized it as happy, sad, or frightening [87].

Unconscious appraisals must respond to cues in music that lead to basic emotions. The rapidity of the process implies that it is without access to working memory and has minimal computational power. Once again, Aristotle (*Politics*, 1340a11 *et seq.*) seems to have had the right idea. The cues are mimetic: music mimics emotional behavior, speech, and thought [33], as follows.

- happiness – medium tempo, loud, wide range of pitches in melody, major scale, consonant;
- sadness – slow tempo, soft, low pitch, small range of pitches, minor scale, mildly dissonant;
- anxiety – rapid tempo, moderate volume, low pitch, minor scale, dissonant;
- anger – rapid tempo, loud, high pitch, minor scale, dissonant.

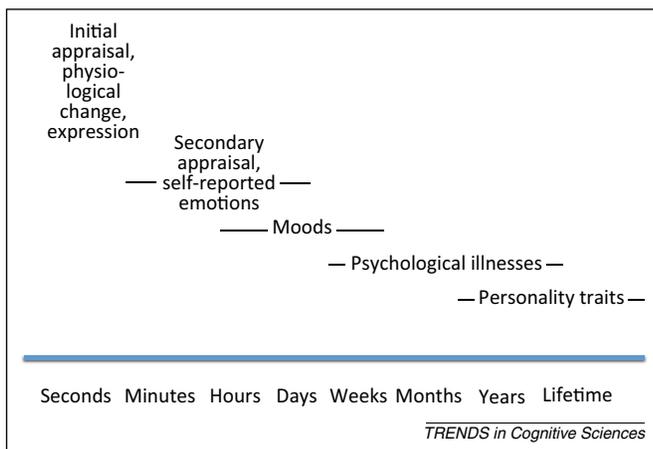
Studies have confirmed effects of scales [88] and tempi [87]. Music with mixed cues, such as a major key but a slow tempo, elicits mixed emotions [89].

physiological and behavioral indices, through self-reports, to interviews and questionnaires.

The most distinctive theme of the theories presented here is that emotions are caused by appraising events in relation to concerns. Despite debates over definitions and criteria, there is agreement among the three theorists presented here, as well as in the whole community of

emotion researchers, that emotions are generally caused in this way [35]. The theories presented here concur in postulating an initial automatic appraisal that does not require conscious processing, then a secondary appraisal that often includes conscious reflection on the meaning of the emotion and that can lead to new intentions. A third phase of appraisal is social, when emotions are verbally confided to others [34]. Other influential themes, shared by the theories, are that emotions involve an urge to action with accompanying arousal, that they include a large component of social and idiosyncratic construction, and that they have functions in social relating.

The theories diverge on three main issues. First, they differ in the result of initial appraisals. The action-readiness theory postulates states of readiness as results. The core-affect theory postulates a state of pleasure or displeasure. The communicative theory postulates a small set of basic emotions. Second, the theories differ about the nature of basic emotions. The ur-emotions of the action-readiness theory vary from pleasure to pain and core affect has a dimension from pleasure to displeasure, so for these theories there are just two basic states, positive and negative. By contrast, according to the communicative theory, appraisal yields one or more of a small set of basic emotions. Although happiness is pleasant and sadness, anger, and fear are generally unpleasant, it does not follow that only these two fundamental (basic) emotional states exist. No more does it follow that only two aqueous solutions exist because any solution is either acidic or alkaline. Third, the theories differ about the role of goals and plans in emotion. Both the action-readiness and communicative theories postulate that they are critical to the function of emotions in guiding action. The core-affect theory assumes that appraisals are simple and yield only states of arousal and pleasure or displeasure, followed by social construction of emotional experience from prototypes. Approaches that neglect goals and plans tend to be less good at elucidating causes and effects of emotions [36]. Several outstanding problems in research on emotions reflect these divergences (Box 4).



**Figure 2.** Time spectrum of different emotional phenomena. Initial appraisals with accompanying physiological changes and expressions last only a few seconds. Episodes of emotion that people can report and discuss with each other tend to last for minutes or hours, sometimes longer. Moods tend to last for hours, days, or weeks. Psychological illnesses (emotional disorders), such as depression and anxiety states, are mostly defined as lasting at least 2 weeks. Emotion-based traits of personality such as shyness or cheerfulness can last a lifetime.

### Evidence for cognitive approaches

In investigating cognitive approaches, Roseman and Evdocas have shown experimentally that appraisals are not just *post hoc* impressions, but causes of emotions [37]. It has also been found that appraisal rather than the situation determines the emotion; appraisal predicts the intensity of emotions and the same sorts of appraisal yields the same sorts of emotion [38]. The best method of reducing the intensity of a distressing emotion once it has started is reappraisal of events giving rise to it and of the current situation [39].

Because cognitive approaches propose that emotions relate events to concerns, investigations based on emotion diaries, kept by people who can report on both events and concerns, are apposite. Proponents of the three theories discussed here have used them [32,40,41]. In one method, participants keep a diary of episodes of emotion and record what happened, what their emotion or emotions were, what their goals or concerns were, who else was there, and so on. Diaries of this kind have shown that in 31% of

**Box 4. Outstanding questions**

- What is the basis of emotional experience? Is it positive-versus-negative valence [25], a small number of basic emotions [29], or a larger number of states of action readiness [11]?
- Are emotional terms in natural languages coherent [90] and can theories of emotion explain them?
- Can a cognitive theory of emotion be implemented in a computer model [91] that can infer emotions from stories?
- Current theories of emotion tend to concern individual experience. Can they, and their accompanying methodologies, be extended to deal with social roles of emotions?
- What part does consciousness play in emotional life? Panksepp proposes that emotion is the original form of consciousness [92]. He also proposes a set of basic emotions that each has an underlying neural system. Baumeister and Masicampo propose that consciousness is a simulation that relates past experience to current social and emotional concerns and to possible actions [93]. Can these two theories be integrated in a testable way?

episodes two or more emotions occurred simultaneously and in 30% of episodes emotions changed as they proceeded [32]. A corollary is that emotional regulation in daily life may be less a matter of adjusting the intensity of an emotion and more a matter of selecting which emotion to attend to [42]. Using a different method, experience sampling in which people record their emotion when signaled to do so at random times, it was found that those who focused on pleasure and displeasure experienced the largest changes in self-esteem [41]. In another diary method, participants look out for events likely to produce emotions. In one study, people looked out for something going wrong in an arrangement with someone else. When this occurred, people were good at recognizing anger in the other person [43], which according to the communicative theory [29] sets up a relationship of conflict, but they were bad at recognizing some other emotions, especially shame.

Emotions affect other psychological functions. Memory for events with emotional aspects is better than that for events without them [44]. Likewise, emotions affect attention. Happiness tends to broaden it. Anxiety tends to narrow it [45,46].

In research on social effects of emotions, the ultimatum game has been used. In it, one player is asked how to share a sum of money with another player. If the second player accepts, both keep the suggested shares. If the second player declines, neither gets anything. Economic considerations imply that the second player should accept any amount greater than zero, but decisions to accept hinge on emotional reactions to the fairness of the proposed division. An offer such as \$1, of \$10 to be shared, engenders anger and disgust and it is usually rejected [47]. Emotions can drive social decisions.

An important corroboration of cognitive approaches to emotions is in their wide application to different aspects of mental life. In particular the communicative theory has led to studies of how emotions affect reasoning (Box 1), of how reading literature enhances empathy (Box 2), and of how music can prompt emotions (Box 3). As the following section shows, it also offers an explanation of psychological illnesses.

**Emotions and psychological illnesses**

Hard-nosed psychiatrists attribute psychological illnesses to defects in the brain; psychoanalysts attribute them to

unconscious conflicts; cognitive therapists attribute them to faulty reasoning [48]. A recent development, however, proposes that psychological illnesses are due to emotions experienced more intensely than usual [49,50]; such illnesses are, indeed, emotional disorders. In such a disorder, a cognitive appraisal elicits a basic emotion appropriate to the situation, but excessive in its intensity: a hyper-emotion. Hyperintense anxiety about health can become hypochondria, hyperintense fears can become phobias, hyperintense sadness can become depression, and hyperintense anxiety and disgust can cause obsessional-compulsive disorder. Patients are often aware of the cause of their emotion, but not of why it is so intense.

A small-scale epidemiological study based on psychiatric reports about the onset of patients' illnesses showed the prevalence of basic emotions [50]. One exception was that obsessive-compulsive people often reported guilt, a complex emotion. The study did not include anger, because its role in psychopathology is poorly understood [51]. Brain-imaging studies bear out the role of basic emotions in psychological illnesses [52]. One way to diagnose psychological illness is to examine how people react to emotions [53,54]. Contrary to a major tenet of cognitive therapy, patients tend to reason better than control participants, but only with inferences relevant to their illness [55]. Studies also show that psychiatric patients tend to be less emotionally intelligent than others [56,57]. If a hyper-emotion does not wane spontaneously, a therapeutic goal is to deter unconscious transitions leading to it.

**Concluding remarks**

Cognitive theorists propose that emotions are sources of value that originate in cognitions. These cognitions appraise events: real as in everyday life, imagined as in fiction, or abstract as in music. The nature of the emotion that occurs is a matter of controversy. It may derive from an ur-emotion of action readiness or from core affect or it may be one of a small number of basic emotions. A goal of future research is to decide among these possibilities (Box 4). In any event, an emotion can be a heuristic for moral (that is to say, social) judgments, although emotion and judgment are dissociable [58,59].

Emotions are both the glue and the gunpowder of human social relations. They establish happy cooperation and they can threaten to blow relationships apart in angry conflict. For the three theories presented here, as well as for other accounts, a central task for future emotion research is to focus on the functions of emotions in social relationships [60].

**Appendix A. Supplementary data**

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.tics.2013.12.004>.

**References**

- 1 Reisenzein, R. (2006) Arnold's theory of emotion in historical perspective. *Cogn. Emot.* 20, 920–951
- 2 Moors, A. et al. (2013) Appraisal theories of emotion: state of the art and future development. *Emot. Rev.* 5, 119–124
- 3 Lazarus, R.S. (1966) *Psychological Stress and the Coping Process*, McGraw-Hill

- 4 Simon, H.A. (1967) Motivational and emotional controls of cognition. *Psychol. Rev.* 74, 29–39
- 5 Friedman, B.H. and Kriebig, S.D. (2010) The biopsychology of emotion: current theoretical, empirical, and methodological perspectives. *Biol. Psychol.* 84, 381–382
- 6 Ekman, P. and Cordaro, D. (2011) What is meant by calling emotions basic. *Emot. Rev.* 3, 364–370
- 7 Oatley, K. *et al.* (2011) *Cognition and Emotion* over twenty-five years. *Cogn. Emot.* 25, 1341–1348
- 8 Keltner, D. *et al.* (2013) *Understanding Emotions*. (3rd edn), Wiley
- 9 Frijda, N.H. (1986) *The Emotions*, Cambridge University Press
- 10 Frijda, N.H. (2007) *The Laws of Emotion*, Erlbaum
- 11 Frijda, N.H. and Parrott, W.G. (2011) Basic emotions or ur-emotions. *Emot. Rev.* 3, 416–423
- 12 Ortony, A. (2009) Affect and emotions in intelligent agents: why and how? In *Affective Information Processing*, pp. 11–21, Springer
- 13 Clore, G.L. and Ortony, A. (2013) Psychological construction in the OCC model of emotion. *Emot. Rev.* 5, 335–343
- 14 Clore, G.L. and Palmer, J. (2009) Affective guidance of intelligent agents: how emotion controls cognition. *Cogn. Syst. Res.* 10, 21–30
- 15 Dan-Glauser, E.S. and Gross, J. (2013) Emotion regulation and emotion coherence: evidence for strategy-specific effects. *Emotion* 15, 832–842
- 16 Hudlicka, E. (2011) Guidelines for designing computational models of emotions. *Int. J. Synth. Emot.* 2, 26–79
- 17 Frijda, N.H. and Sundararajan, L. (2007) Emotion refinement: a theory inspired by Chinese poetics. *Perspect. Psychol. Sci.* 2, 227–241
- 18 Boiger, M. and Mesquita, B. (2012) The construction of emotion in interactions, relationships, and cultures. *Emot. Rev.* 4, 221–229
- 19 Russell, J.A. (2003) Core affect and the psychological construction of emotion. *Psychol. Rev.* 110, 145–172
- 20 Yik, M. *et al.* (2011) A 12-point circumplex structure of core affect. *Emotion* 11, 705–731
- 21 Kuppens, P. *et al.* (2013) The relation between valence and arousal in subjective experience. *Psychol. Bull.* 139, 917–940
- 22 Reisenzein, R. (1983) The Schachter theory of emotion: two decades later. *Psychol. Bull.* 94, 239–264
- 23 Nelson, N.L. and Russell, J.A. (2013) Universality revisited. *Emot. Rev.* 5, 8–15
- 24 Gendron, M. *et al.* (2013) Emotion perception: putting the face in context. In *The Oxford Handbook of Cognitive Psychology* (Reisberg, D., ed.), pp. 539–556, Oxford University Press
- 25 Barrett, L.F. and Bliss-Moreau, E. (2009) Affect as a psychological primitive. *Adv. Exp. Soc. Psychol.* 41, 167–218
- 26 Lindquist, K.A. and Barrett, L.F. (2012) A functional architecture of the human brain: emerging insights from the science of emotion. *Trends Cogn. Sci.* 16, 533–540
- 27 Wilson-Mendelhall, C.D. *et al.* (2013) Neural evidence that human emotions share core affective properties. *Psychol. Sci.* 24, 947–956
- 28 Oatley, K. and Johnson-Laird, P.N. (1987) Towards a cognitive theory of emotions. *Cogn. Emot.* 1, 29–50
- 29 Oatley, K. and Johnson-Laird, P.N. (2011) Basic emotions in social relationships, reasoning, and psychological illnesses. *Emot. Rev.* 3, 424–433
- 30 Nesse, R. and Ellsworth, P.C. (2009) Evolution, emotions, and emotional disorders. *Am. Psychol.* 64, 129–139
- 31 Rozin, P. *et al.* (2008) Disgust. In *Handbook of Emotions* (3rd edn) (Lewis, M. *et al.*, eds), pp. 757–776, Guilford
- 32 Oatley, K. and Duncan, E. (1994) The experience of emotions in everyday life. *Cogn. Emot.* 8, 369–381
- 33 Reisenzein, R. (1995) On Oatley and Johnson-Laird's theory of emotions and hierarchical structures. *Cogn. Emot.* 9, 383–416
- 34 Johnson-Laird, P.N. and Oatley, K. (2013) Emotions in music, literature, and film. In *Handbook of Emotions* (4th edn) (Barrett, M. *et al.*, eds), Guilford (in press)
- 35 Izard, C.E. (2010) The many meanings/aspects of emotion: definitions, functions, activation, and regulation. *Emot. Rev.* 2, 363–370
- 36 Rimé, B. (2009) Emotion elicits social sharing of emotion: theory and empirical review. *Emot. Rev.* 1, 60–85;
- Moors, A. (2009) Theories of emotion causation: a review. *Cogn. Emot.* 23, 625–662
- 37 Roseman, I. (2013) Appraisal in the emotion system: coherence in strategies for coping. *Emot. Rev.* 5, 141–149
- 38 Siemer, M. *et al.* (2007) Same situation – different emotions: how appraisals shape our emotions. *Emotion* 7, 592–600
- 39 Webb, T.L. *et al.* (2012) Dealing with feeling: a meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation. *Psychol. Bull.* 138, 775–808
- 40 Frijda, N.H. *et al.* (1991) The duration of affective phenomena or emotions, sentiments and passions. In *International Review of Emotion* (Vol. 1) (Strongman, K.T., ed.), In pp. 187–225, Wiley
- 41 Pietromonaco, P.R. and Barrett, L.F. (2009) Valence focus and self-esteem liability: reacting to hedonic cues in the social environment. *Emotion* 9, 106–418
- 42 Mesquita, B. and Frijda, N.H. (2011) An emotion perspective on emotion regulation. *Cogn. Emot.* 25, 782–784
- 43 Laroque, L. and Oatley, K. (2006) Joint plans, emotions, and relationships: a diary study of errors. *J. Cult. Evol. Psychol.* 4, 246–265
- 44 Talmi, D. (2013) Enhanced emotional memory: cognitive and neural mechanisms. *Curr. Dir. Psychol. Sci.* 22, 430–436
- 45 Eysenck, M. *et al.* (2007) Anxiety and cognitive performance: attentional control theory. *Emotion* 7, 336–353
- 46 Huntsinger, J.R. (2013) Does emotion directly tune the scope of attention? *Curr. Dir. Psychol. Sci.* 22, 265–270
- 47 Harlé, K.M. and Sanfey, A.G. (2010) Effects of approach and withdrawal motivation on interactive economic decisions. *Cogn. Emot.* 24, 1456–1465
- 48 Mansell, W. *et al.* (2009) Conceptual foundations of the transdiagnostic approach to CBT. *J. Cogn. Psychother.* 23, 6–19
- 49 Johnson-Laird, P.N. *et al.* (2006) A hyper-emotion theory of psychological illnesses. *Psychol. Rev.* 113, 822–841
- 50 Gangemi, A. *et al.* (2013) Models and cognitive change in psychopathology. *J. Cogn. Psychol.* 25, 157–164
- 51 Novaco, R.W. (2010) Anger and psychopathology. In *International Handbook of Anger* (Potegal, M. *et al.*, eds), pp. 465–497, Springer
- 52 Servaas, M.N. *et al.* (2013) Neuroticism and the brain: a quantitative meta-analysis of neuroimaging studies investigating emotion processing. *Neurosci. Biobehav. Rev.* 37, 1518–1529
- 53 Carver, C.S. *et al.* (2013) Major depressive disorder and impulsive reactivity to emotion: toward a dual-process view of depression. *Br. J. Clin. Psychol.* 52, 285–299
- 54 Johnson, S.L. *et al.* (2013) Impulsive responses to emotion as a transdiagnostic vulnerability to internalizing and externalizing symptoms. *J. Affect. Disord.* 150, 872–878
- 55 Gangemi, A. *et al.* (2013) Emotion, reasoning, and psychopathology. In *Emotion and Reasoning* (Blanchette, I., ed.), pp. 44–83, Psychology Press
- 56 Hertel, J. *et al.* (2009) Emotional intelligence and mental disorder. *J. Clin. Psychol.* 65, 942–954
- 57 Onur, E. *et al.* (2013) Alexithymia and emotional intelligence in patients with panic disorder, generalized anxiety disorder and major depressive disorder. *Psychiatr. Q.* 84, 303–311
- 58 Bucciarelli, M. *et al.* (2008) The psychology of moral reasoning. *Judgm. Decis. Mak.* 3, 121–139
- 59 Horberg, E. *et al.* (2011) Emotions as moral amplifiers: an appraisal tendency approach to the influences of distinct emotions upon moral judgment. *Emot. Rev.* 3, 237–244
- 60 Parkinson, B. (2013) Journeys to the center of emotion. *Emot. Rev.* 5, 180–184
- 61 Lee, N.Y.L. *et al.* (2008) The psychological problem of Sudoku. *Think. Reason.* 14, 342–364
- 62 Johnson-Laird, P.N. (2006) *How We Reason*, Oxford University Press
- 63 Blanchette, I. and Richards, A. (2010) The influence of affect on higher level cognition: a review of research on interpretation, judgement, decision-making and reasoning. *Cogn. Emot.* 15, 561–595
- 64 Goel, V. and Vartanian, O. (2011) Negative emotions can attenuate the influence of beliefs on logical reasoning. *Cogn. Emot.* 25, 121–131
- 65 Eliades, M. *et al.* (2012) An investigation of belief-bias and logicity in reasoning with emotional contents. *Think. Reason.* 18, 461–479
- 66 Blanchette, I. and Campbell, M. (2012) Reasoning about highly emotional topics: syllogistic reasoning in a group of war veterans. *J. Cogn. Psychol.* 24, 157–164
- 67 Blanchette, I. *et al.* (2007) Reasoning about emotional contents following shocking terrorist attacks: a tale of three cities. *J. Exp. Psychol. Appl.* 13, 47–56

- 68 Blanchette, I. and Caparos, S. (2013) When emotions improve reasoning: the possible roles of relevance and utility. *Think. Reason.* 19, 399–413
- 69 Oatley, K. (2012) The cognitive science of fiction. *Wiley Interdiscip. Rev. Cogn. Sci.* 3, 425–430
- 70 Oatley, K. (2012) *The Passionate Muse: Exploration of Emotion in Stories*, Oxford University Press
- 71 Oatley, K. (1999) Why fiction may be twice as true as fact: fiction as cognitive and emotional simulation. *Rev. Gen. Psychol.* 3, 101–117
- 72 Oatley, K. (2011) *Such Stuff As Dreams: The Psychology of Fiction*, Wiley
- 73 Mar, R.A. *et al.* (2011) Emotion and narrative fiction: interactive influences before, during, and after reading. *Cogn. Emot.* 25, 818–833
- 74 Baron-Cohen, S. *et al.* (2001) The “Reading the Mind in the Eyes” Test revised version: a study with normal adults, and adults with Asperger’s syndrome or high-functioning autism. *J. Child Psychol. Psychiatry* 42, 241–251
- 75 Mar, R.A. *et al.* (2009) Exploring the link between reading fiction and empathy: ruling out individual differences and examining outcomes. *Communications* 34, 407–428
- 76 Kidd, D.C. and Castano, E. (2013) Reading literary fiction improves theory of mind. *Science* 342, 377–380
- 77 Djikic, M. *et al.* (2013) Reading other minds: effects of literature on empathy. *Sci. Study Lit.* 3, 28–47
- 78 Djikic, M. *et al.* (2012) Genre or artistic merit: the effect of literature on personality. *Sci. Study Lit.* 2, 25–36
- 79 Kawakami, A. *et al.* (2013) Relations between musical structures and perceived and felt emotions. *Music Percept.* 30, 407–417
- 80 Eerola, T. and Vuoskoski, J.K. (2013) A review of music and emotion studies: approaches, emotion models and stimuli. *Music Percept.* 30, 307–340
- 81 Koelsch, S. (2010) Towards a neural basis of music-evoked emotions. *Trends Cogn. Sci.* 14, 131–137
- 82 Trost, W. *et al.* (2012) Mapping aesthetic musical emotions in the brain. *Cereb. Cortex* 22, 2769–2783
- 83 Chanda, M.L. and Levitin, D.J. (2013) The neurochemistry of music. *Trends Cogn. Sci.* 17, 179–193
- 84 Juslin, P.N. *et al.* (2008) An experience sampling study of emotional reactions to music: listener, music, and situation. *Emotion* 8, 668–683
- 85 Juslin, P.N. and Timmers, R. (2010) Expression and communication of emotion in music performance. In *Handbook of Music and Emotion: Theory, Research, Applications* (Juslin, P.N. and Sloboda, J.A., eds), pp. 453–489, Oxford University Press
- 86 Juslin, P.N. *et al.* (2011) Emotional reactions to music in a nationally representative sample of Swedish adults: prevalence and causal influences. *Music. Sci.* 15, 174–207
- 87 Fritz, T. *et al.* (2009) Universal recognition of three basic emotions in music. *Curr. Biol.* 19, 1–4
- 88 Temperley, D. and Tan, D. (2013) Emotional connotations of diatonic modes. *Music Percept.* 30, 237–257
- 89 Hunter, P.G. *et al.* (2008) Mixed affective responses to music with conflicting cues. *Cogn. Emot.* 22, 327–352
- 90 Tausczik, Y.R. and Pennebaker, J.W. (2010) The psychological meaning of words: LIWC and computerized text analysis methods. *J. Lang. Soc. Psychol.* 29, 24–54
- 91 Reisenzein, R. (2009) Emotional experience in the computational belief-desire theory of emotion. *Emot. Rev.* 1, 206–213
- 92 Panksepp, J. and Biven, L. (2012) *The Archaeology of Mind: Neuroevolutionary Origins of Human Emotions*, Norton
- 93 Baumeister, R.F. and Masicampo, E.J. (2010) Conscious thought is for facilitating social and cultural interactions: how mental simulations serve the animal–culture interface. *Psychol. Rev.* 117, 945–971