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On Oatley and Johnson-Laird's Theory of Emotion and Hierarchical Structures in the Affective Lexicon

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The semantic theory of emotion words recently proposed by Johnson-Laird and Oatley (1989) was empirically investigated in three studies. In all three studies, I assessed, for different samples of German nonbasic emotion words: (a) subjects' judgements of the conditional probability of experiencing basic emotions, given the experience of nonbasic ones; and (b) their beliefs about whether it is possible to experience nonbasic emotions without also experiencing basic emotions. In Study 1, I examined the proposed semantic relations between 48 nonbasic and their defining basic emotion words, as well as 14 of the proposed semantic relations among nonbasic emotion words. In Study 2, these tests were repeated using object-focused test sentences. In Study 3, the semantically based relations among 12 emotions were compared to all of the nonsemantic relations existing among these emotions, and the theory was additionally tested by examining self-ascriptions of emotion words in concrete situations (hypothetical scenarios). I found that (1) the semantic theory of emotion words proposed by Johnson-Laird and Oatley (1989) was consistently unsupported for the disgust-derivatives, and that in a substantial number of cases a second nonbasic emotion was nearly as prominent as the modal one (Study 1); (2) the conditional probability and possibility relations between allegedly semantically connected emotion pairs were frequently no stronger or even weaker than those between semantically unconnected ones (Studies 1, 3); (3) in terms of absolute judgements, the data fell considerably short of the theoretically predicted results (all studies), particularly when (4) object-focused emotion words were used (Study 2); and (5) no more favourable results were obtained when subjects' self-ascriptions of emotion words in concrete situations were examined (Study 3). These findings call in question Johnson-Laird and Oatley's semantic theory of emotion words and potentially also their theory of emotions.

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INTRODUCTION

According to the theory of emotions recently proposed by Oatley and Johnson-Laird (1987, 1992; see also Oatley, 1988; Johnson-Laird & Oatley, 1989, 1992), emotions come in two varieties, basic and complex ones. *Basic emotions* (happiness, sadness, anger, fear, and disgust) are regarded as centrally produced, unanalysable “raw feelings” or conscious qualia which resemble sensations of pain, tastes, odours, colours, and tones in at least two respects: first, they are characterised by a distinctive phenomenal quality, and secondly, they are intrinsically objectless or nonintentional (nonrepresentational) mental states or, as the authors prefer to say, “nonpropositional signals” (cf. e.g. Brentano, 1874/1955; Searle, 1983; see also Reisenzein & Schönplflug, 1992). *Complex emotions* (e.g. guilt, pity, tenderness) are held to be complex mental states consisting of two causally linked components: (a) a basic emotional quality; and (b) a particular cognition (cognitive appraisal) which caused the basic feeling (Johnson-Laird & Oatley, 1989, p. 86).

Although Oatley and Johnson-Laird’s (1987) theory of emotions is not new—being essentially a revival, in modernised form, of the theory of emotions proposed by Descartes in 1649 (Descartes, 1649/1984)—I think that it deserves attention, because it has a number of features that make it *prima facie* attractive. In particular, it integrates three important traditions of theorising on emotions: (1) The tradition of *basic emotion theories*, according to which the multitude of emotions can be reduced—perhaps with the help of further elements—to a small set of basic emotions; (2) the tradition of *independent systems theories* (which typically go hand in hand with basic emotion theories), according to which cognitions and emotions are fundamentally different and partly independent kinds of mental states (in particular, emotions are, in contrast to cognitions, intrinsically objectless, or at least have a nonintentional component at their core); and (3) the *cognitive tradition*, according to which cognitive appraisals are of fundamental importance to emotions. Oatley and Johnson-Laird’s (1987) theory grants partial correctness to all of these traditions, by integrating them in a way that, at first sight at least, seems to exploit their respective strengths and to avoid their more obvious weaknesses.

However, these merits of Oatley and Johnson-Laird’s (1987) theory of emotion have not convinced its critics, who have challenged the theory on several grounds (e.g. Frijda, 1987; Ortony & Clore, 1989; Ortony & Turner, 1990; see Oatley & Johnson-Laird, 1990, for a reply). In addition, there is currently little empirical support for the theory, at least support from studies undertaken with the explicit aim of testing the theory. In fact, at the time when the studies reported below were conducted, the only published piece of supportive evidence that was

directly motivated by the theory consisted of an intuitive semantic analysis of nearly 600 English emotion words (Johnson-Laird & Oatley, 1989).¹ This analysis was based on Johnson-Laird and Oatley’s (1989) assumption—which I find quite reasonable—that the structure of emotions is approximately reflected in the structure of the affective lexicon. Hence, the authors reasoned, if their theory of emotions is correct, then its essential features should show up in an analysis of the meanings of emotion words. According to Johnson-Laird and Oatley (1989), this was indeed found to be the case.

Objectives of the Present Research

In this article, I report three studies aimed at empirically testing Johnson-Laird and Oatley’s (1989) semantic analysis of emotion words or, as I will henceforth also say, their *Semantic Theory of the Affective Lexicon* (STAL; cf. Johnson-Laird and Oatley, 1992). Such an empirical test is necessary for the following reasons: (1) Johnson-Laird and Oatley’s (1989) STAL is exclusively based on these authors’ intuitions. As the history of philosophical analyses of ordinary language amply illustrates (cf. e.g. Hoche & Strube, 1985), such intuitions may go awry, particularly if, as in the present case, they are influenced by *a priori* theoretical convictions (for a further illustration, see Reisenzein, Debler, & Siemer, 1992). (2) There exist alternative, and in my view no less plausible semantic theories of emotion words that conflict with Johnson-Laird and Oatley’s STAL (e.g. Mees, 1985, 1991; Wierzbicka, 1972, 1992). Therefore, before Johnson-Laird and Oatley’s (1989) STAL can be accepted—which is the precondition for regarding it as support for their theory of emotions—it is indispensable to check its validity with data from theoretically naïve, but linguistically competent speakers. A first, partial test of Johnson-Laird and Oatley’s (1989) STAL, published after the studies described later had been

¹ In the meantime, Oatley and Duncan (1992) have presented a further piece of evidence for their theory of emotions. Using an emotion diary approach, they found that, in a small number of cases, people reported to experience basic emotions without being aware of a reason for their feelings. Oatley and Duncan (1992) interpret this finding as showing that basic emotions can indeed occur in objectless forms, as predicted by their theory. However, apart from the fact that this prediction could not be confirmed for disgust, the finding that people sometimes name no specific object of their feelings is hardly strong evidence that these emotion instances are truly objectless; it may only reflect that their objectives are very general, vague, or difficult to verbalise (Reisenzein & Schönplflug, 1992). In fact, Oatley’s (1988) own description of ostensibly objectless fear, namely as “a feeling of dread *that something awful is going to happen*” (p. 347; italics added) is quite clearly not a description of objectless fear, but of fear with an extremely vague object.

completed, was reported by Jones and Martin (1992). However, their study was limited to a test of disjunctively defined emotion words (see below), and although the results tended to disconfirm these definitions, it seems that Johnson-Laird and Oatley could account for the findings by relatively minor modifications of their assumptions (Jones & Martin, 1992, p. 381ff; see also Oatley & Duncan, 1992).

In the rest of the Introduction, I first summarise the essentials of Johnson-Laird and Oatley's (1989) semantic theory of the affective lexicon and then explain the logic of my empirical tests of this theory.

Structure of the Affective Lexicon according to Johnson-Laird and Oatley

In line with their assumption that the affective lexicon reflects the structure of emotions as described by their theory, Johnson-Laird and Oatley (1989) propose that the structure of that lexicon is (largely; see later) hierarchical. More precisely, it is claimed that emotion words fall into two major categories: (1) Words that denote basic emotions—these are the terms “happiness”, “sadness”, “anger”, “fear”, “disgust”, and their synonyms—and (2) words that denote various modifications or elaborations of the basic emotions (e.g. “euphoria”, “pity”, or “remorse”). Basic emotion words are taken as semantic primitives of the proposed analysis; that is, they have no other emotion terms (except perhaps synonymous ones) as semantic components.² In contrast, nonbasic emotion words are regarded as direct or indirect hyponyms of the basic concepts, i.e. their defining features include one or several basic emotion terms. More precisely, nonbasic emotion words are analysed into two semantic components: (a) A component denoting one—or, in some cases, a disjunction of several (see later)—basic emotions (i.e. one or a disjunction of several basic emotion words); and (b) an additional component that expresses a modification or elaboration of the basic emotion(s). In some cases, this modification concerns only the temporal duration or intensity of basic emotions (e.g. “euphoria” is analysed as “intense happiness”; Johnson-Laird & Oatley, 1989, p. 113); but in most cases, it concerns an elaboration of basic emotions in terms of various types of cognitive appraisals by which they are caused, reflecting the complex emotions postulated by Oatley and Johnson-Laird's theory of emotions. To illustrate, “remorse”

is analysed as “sadness as a result of evaluating one's past performances as morally wrong” (Johnson-Laird & Oatley, 1989, p. 118).

Nonbasic emotion words are further subdivided by Johnson-Laird and Oatley (1989) into several subgroups on the basis of linguistic considerations; but it is not necessary for the present purposes to explain these subgroups in detail. What must be noted, however, is (a) that several nonbasic emotion words are not defined directly by basic emotion words (and other semantic components), but are only indirectly related to them through a chain of definitions (e.g. “humiliation” is analysed as a hyponym of “shame”, “shame” as a hyponym of “self-disgust”, and “self-disgust” as a hyponym of “disgust”); and (b) that some nonbasic emotion words are given a disjunctive definition, i.e. they are defined by reference to more than one basic or nonbasic emotion (e.g. “embarrassment” is defined as “mild fear or shame as a result of evaluating self in relation to others”; Johnson-Laird & Oatley, 1989, p. 113). These disjunctive definitions are the reason why the structure of the affective lexicon is not *strictly* hierarchical. A segment of the affective lexicon, which covers the semantic relations among emotion words examined in studies 1 and 2, is shown in Fig. 1.

For the studies reported later, the following two assumptions contained in Johnson-Laird and Oatley's (1989) STAL are particularly important. *First*, the majority of nonbasic emotion words (i.e. all except the disjunctively defined ones) are assumed to have a “classical” definition (Smith & Medin, 1981); that is, they are defined by means of individually necessary and jointly sufficient features (semantic components). Hence, Johnson-Laird and Oatley (1989) assume—in line with authors such as Mees (1985, 1991), Smedslund (1988), or Wierzbicka (1972, 1992), but in contrast to other investigators of the semantic lexicon (e.g. Conway, 1990; Russell, 1991; Shaver, Schwartz, Kirson, & O'Connor, 1987)—that a meaningful distinction can be drawn in ordinary language between *necessarily* (more precisely, analytically) true and *contingently* true statements containing emotion words; that is, between statements that are true solely by virtue of the meanings of the involved words (comparable to “all vixens are female”) and those that are true by virtue of matters of fact (comparable to “all vixens have hearts”). *Secondly*, it is assumed that the definitions of emotion words are stored in memory in an explicit format. The precise nature of this representation is not indicated, but Johnson-Laird and Oatley's (1989) STAL would seem to be compatible with a variety of previously proposed representational schemes, for example a semantic marker, meaning postulates, or semantic network representation (see e.g. Johnson-Laird, 1983; McNamara & Miller, 1989). This second assumption—which, I think, is a necessary consequence of the first one—is important for the following reason. It is widely held that word

² According to Johnson-Laird and Oatley (1989, p. 90ff.), basic emotion words have no classical definition at all, but only a probabilistic or “prototype” definition (cf. Smith & Medin, 1981).

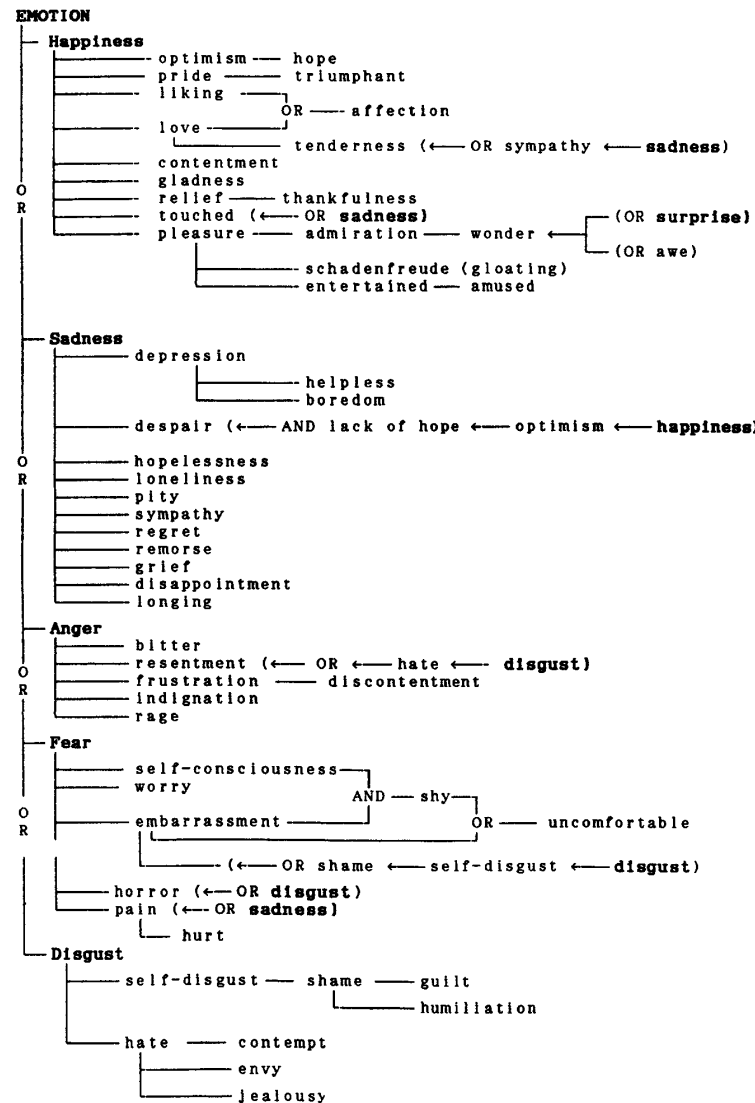


FIG. 1. Part of the affective lexicon according to Johnson-Laird and Oatley. To avoid cluttering, disjunctively defined emotion words are always listed with one of the basic emotion words, and their relations to other basic or nonbasic emotion words are indicated in parentheses.

meanings, including the meanings of emotion terms, constitute tacit knowledge in the sense that they cannot simply be "introspected" and reported on demand, but must be inferred from the use of these words (Johnson-Laird & Oatley, 1989, p. 83; see also Russell, 1980). The typical use of emotion words consists, I think, of the self- and other-ascription of emotion labels in *concrete instances* of emotions; hence, this is one, and some might say the best place where to look for the manifestation of semantic rules (for more detail, see Study 3). However, if the proposed semantic relations between emotion words—which specify general relations between emotion *types*—are stored in an explicit format in semantic memory, it is reasonable to expect that they should also be accessible somewhat more directly. In particular, it is reasonable to expect that people who know the meanings of classically defined words are able to indicate whether immediate analytical implications of these definitions are true, if specifically asked for them (cf. "Are all vixens female?"). This assumption, which is in fact explicitly made by Johnson-Laird and Oatley (1989, p. 103; see also Oatley & Johnson-Laird, 1992), formed the basis of Studies 1 and 2 and partly also of Study 3.

Rationale and Overview of the Studies

The three studies reported below had in common that subjects were asked to answer, for different samples of (German equivalents of) the emotion words analysed by Johnson-Laird and Oatley (1989), two types of test sentences designed to elicit aspects of folk knowledge (or, as one should say more cautiously, folk beliefs) about emotion relations that are of direct relevance to the proposed semantic theory.³ These tests focused on the

³ I speak of *beliefs about emotion relations* because I want to have available a general term that covers both (presumably) semantically based and nonsemantic relations between emotions, and because I want to leave it open whether the alleged semantic relations are indeed based on semantic connections between emotion words, reflect perceived empirical covariations of emotions, or whether both is the case to varying degrees.

To simplify the ensuing presentation, I will from now on speak, not only of (perceived) empirical, but also of (presumed) semantic relations between *emotions*. Strictly speaking, of course, semantic relations hold only between linguistic objects (words/concepts or sentences/propositions). Therefore, when I say that two emotions A and B are semantically related, this is to be understood as meaning that the two emotion words or concepts "A" and "B" stand in a semantic (specifically, a hyponym) relation; when I say that emotion B is a defining feature of emotion A, I mean that the word or concept "B" is a component of the definition of the word or concept "A", and so on. As an additional terminological simplification, the referents of the selected nonbasic emotion terms will be called "nonbasic emotions"; but note that Johnson-Laird and Oatley's (1989) complex emotions (i.e. those defined as complexes of basic emotions and appraisals) are only a subgroup of the so-defined nonbasic emotions.

most fundamental assumption of Johnson-Laird and Oatley's (1989) STAL, namely, that nonbasic terms contain one (or, in some cases, a disjunction of several) of the five basic emotion words as necessary semantic components. In addition, several of the proposed semantic relations among nonbasic emotion words were examined.

The two types of test questions were based on the above-mentioned assumption that competent language users are able to indicate whether immediate analytical implications of classically defined words are true, if specifically asked for them. Assuming this to be the case, it was expected that, if the proposed STAL is correct, then for all (nondisjunctively defined) nonbasic emotions A and all those basic or other nonbasic emotions B which belong to the defining features of the corresponding nonbasic emotions, sentences of the form:

(T1) If (i.e. whenever) one feels A, then one also feels B.

should be regarded as true by competent speakers.⁴ To illustrate, if "remorse" is indeed defined in ordinary language as "sadness as a result of evaluating one's past performances as morally wrong", as suggested by Johnson-Laird and Oatley (1989, p. 118), then the sentence "whenever one feels remorse, then one also feels sad" should be assented to by competent speakers.

Furthermore, because T1 is, according to Johnson-Laird and Oatley (1989), not just contingently but necessarily (analytically) true, competent speakers should also assent to the following modalised version of T1:

(T2) It is impossible that someone feels A but not B (cf. Footnote 4).

T1 was proposed by Johnson-Laird and Oatley (1989, p. 103) themselves, whereas T2 was previously suggested by Hoche and Strube (1985) as part of a package of pragmatic-semantic combination tests. In fact, T2 is more appropriate than T1 because, strictly speaking, T1 is only a

⁴ More precisely, the authors propose this test only for the relations between their complex emotion terms (i.e. those defined as complexes of basic feelings and appraisals) and basic emotion terms; but it can be extended to the remaining categories of nonbasic emotion terms.

Note also that the formulations T1 and T2 are meant to be simplified abbreviations. Spelled out more precisely, T1 reads "For all people p at all times t: If p feels A at t, then p also feels B at t"; and T2 reads: "It is impossible that there is a person p or a time t such that p feels A but not B at t". For the object-specified test sentences used in Study 2, an additional argument has to be added that represents the objects at which the emotions are directed; e.g. T1 reads "For all people p at all times t and all objects o: If p feels A towards o at t, then p also feels B towards o at t". Furthermore, for disjunctively defined emotion words, B has to be replaced by an appropriate disjunction of several basic emotion terms; and for emotion words defined by other nonbasic emotion words, B has to be replaced by one, or a disjunction of several, nonbasic emotion words.

test of perceived *universality*, not of *analyticity* (necessary semantic components). That is, T1 does not discriminate between sentences that express analytic truths and those that express empirical regularities held to be generally valid by people (at least within the range of normal experience; cf. Kutschera, 1975). To illustrate this distinction, it is likely that very high endorsements would be obtained, not only for "all vixens are female", but also for "all vixens have hearts", even though only the former is commonly believed to represent an analytic truth. Analogously, people might assent to sentences of the form T1 not because they regard basic emotion terms as necessary or defining constituents of the nonbasic ones, but only because they believe that particular basic emotions occur always or nearly always when particular basic emotions are present. In contrast, T2 encourages people to specifically consider the case—which, according to Johnson-Laird and Oatley, should only be hypothetical—where a nonbasic emotion is present but its defining basic emotion is absent, and to ask themselves whether they would still be willing to apply the nonbasic emotion word in this case. Hence T2 focuses the subjects' attention on the question of the necessity of the basic emotions for the nonbasic ones.

In all three studies, two kinds of test sentences based on T1 and T2, respectively, were used. The actual format of the test sentences differed slightly from T1 and T2, i.e. T1 was modified to permit graded judgements (conditional probability judgements) and T2 was put into question format (see the Method sections for more detail). Furthermore, in Study 2, the test sentences were presented in an object-specified format (for more explanation, see the Introduction to Study 2); and in Study 3, the proposed STAL was tested by examining subjects' self-ascriptions of emotion words in concrete situations (cf. the Introduction to Study 3).

STUDY 1

Method

Subjects

The subjects were 20 introductory psychology students (10 male, mean age 26.8 years) at the Free University of Berlin. All subjects spoke German as their first language and were unaware of both Oatley and Johnson-Laird's (and Descartes') theory of emotions and the goals of the study. Three participants did not return their questionnaires in time, reducing the final sample size to 17. Preliminary data screening revealed no outliers. Although the sample size is modest, the interrater reliability of the mean judgements was already so high at this point (see below) that further increase in sample size would not have substantially changed the results;

in addition, the general form of the results of Study 1 was replicated in Studies 2 and 3 with larger samples.

Materials

Selection of Emotion Words. Of the nearly 600 emotion words analysed by Johnson-Laird and Oatley (1989), about 100 were considered by the authors to be generic affect words (e.g. "emotion", "feeling") or words referring to the five basic emotions. To keep the investigation within manageable limits, I decided to select a representative sample of about 10% from the remaining nonbasic emotion words. The sample had to meet the following requirements: (1) the selected words are familiar to, and their referents are regarded as relatively typical examples of emotions by lay people, as determined by previous empirical studies (e.g. Schmidt-Atzert, 1981; Shaver et al., 1987); (2) the sample contained no synonyms (according to Johnson-Laird & Oatley's semantic analysis); (3) it included several presumed derivatives of each of the five basic emotions; and (4) all of the linguistic subcategories of nonbasic emotion words distinguished by Johnson-Laird and Oatley (1989) had to be represented. These criteria resulted in the selection of 48 nonbasic emotion words. These words, as well as the semantic relations among them and to the basic emotion words, were already shown in Fig. 1.

Selection of Emotion Comparisons. In Study 1, the perceived relations of the 48 nonbasic emotions to each of the five basic emotions were examined, making for a total of 240 nonbasic-basic comparisons. In addition, 14 selected pairs of nonbasic emotion words were included to examine the tenability of the semantic connections claimed to exist by Johnson-Laird and Oatley (1989) between simpler and more complex nonbasic emotion terms (these cover the majority of the postulated definitional relations among the included nonbasic emotions; cf. Fig. 1). Eight of the nonbasic emotion words were disjunctively defined by Johnson-Laird and Oatley, but I decided to examine the relations of these emotions to each of the five basic emotions separately to test the general validity of the proposed disjunctive definitions. In sum, then, 62 of the semantic relations proposed to exist by Johnson-Laird and Oatley (1989) between nonbasic emotions and their defining basic or other nonbasic emotions were investigated (see Fig. 1). Of these, the 40 relations between non-disjunctively defined nonbasic emotions and their defining basic emotions are of highest relevance for the test of the proposed semantic analysis; the 14 relations among nonbasic emotions come second in importance; and the 8 relations of disjunctively defined nonbasic emotions to their defining basic emotions come last.

Translation. The emotion words were translated into German relying on a list of linguistic equivalents of emotion words for five European languages published by Scherer (1988), dictionaries, and my own linguistic intuition (Johnson-Laird & Oatley, 1992, explicitly assert the universality of their STAL). If possible, the emotions words were transformed into noun form. The following German terms were used for the five basic emotions: *Freude* for happiness, *traurig* for sad (the adjective rather than the noun, *Traurigkeit* was used in this case because it is more common in German), *Ärger/Wut* for anger, *Furcht/Angst* for fear, and *Ekel/Abscheu* for disgust. Anger, fear, and disgust were represented by two German words each to protect against the danger that the results would be biased by inadequate basic emotion terms. It was explained to the subjects that they should check the *Ärger/Wut* and *Furcht/Angst* categories whenever one or both of the paired terms seemed appropriate.

Procedure

The subjects were presented with a questionnaire consisting of two parts which contained, respectively, items for the tests T1 and T2 described earlier. The first part contained sentences asking for conditional probability judgements of the form: *If one has/feels [A], then one _____ has/feels [B]*. The empty space was to be filled with a number from 1 to 6, with 1 = never, 2 = rarely, 3 = occasionally, 4 = often, 5 = in most cases, and 6 = always. The second part of the questionnaire asked for possibility judgements, i.e. responses to questions of the form: *Is it possible or conceivable that one has/feels [A], but does not, simultaneously, have/feels [B]*? In this case, the subjects were only asked to answer with yes or no. The meaning of the scales was additionally explained to the subjects (cf. Footnote 4). "A" was always one of the 48 selected nonbasic emotion words, whereas "B" was either one of the five basic emotion words, or—in the case of the 14 comparisons among nonbasic emotion words—one, or a disjunction of several, other nonbasic emotion words used for their definition by Johnson-Laird and Oatley (1989). Altogether, then, 254 conditional probability judgements and as many possibility judgements had to be made. The order of the questions in each part of the questionnaire was randomised. The subjects were asked to complete the questionnaire carefully over a period of 3–4 weeks, answering only one or two pages at a time.

Results

For the conditional probability judgements, the means across subjects were computed, whereas for the possibility judgements, the percentage of subjects was calculated who held that it is impossible to experience

emotion A without simultaneously experiencing emotion B. The interrater reliability (consistency among subjects) for the means of the 254 judgements, as expressed by the intraclass correlation coefficient (ICC[2,k] according to the terminology of Shrout & Fleiss, 1979), was 0.97 for the conditional probability and 0.91 for the possibility judgements (coded as 0 vs. 1).

The subsequent data analysis proceeded in two steps. First, I tested two comparative hypothesis that can be derived from Johnson-Laird and Oatley's (1989) STAL. Secondly, I looked at the absolute size of the means of the conditional probability judgements and the proportions of rejection of the possibility items.

Comparative Hypotheses

If Johnson-Laird and Oatley's (1989) STAL is correct, one should ideally—that is, for competent language users who make no performance errors (see the General Discussion for more detail)—expect to obtain the following results:

1. Nondisjunctively defined nonbasic emotions are more strongly related empirically (i.e. in terms of the conditional probability and possibility judgements) to their defining basic emotions than to the remaining basic emotions. For example, pride should be more strongly related to happiness than to sadness, anger, fear, and disgust (cf. Fig. 1).

2. The relations of nonbasic emotions to their defining emotions are *generally* stronger than those to nondefining emotions. To test this hypothesis, I compared the 54 most relevant "semantic" relations (those between the 40 nondisjunctively defined nonbasic emotions and their defining basic emotions, plus the 14 semantic relations among nonbasic emotions) with the $40 \times 4 = 160$ "nonsemantic" relations between nondisjunctively defined basic emotions and nondefining basic emotions included in the study. Furthermore, I tested this hypothesis conservatively by taking, as the "correct" basic emotion of each nonbasic one, its empirical modal basic emotion (i.e. that for which the highest mean of the conditional probability judgements or the highest proportion of rejections of the possibility judgements was obtained). Hence, for example, hate was taken to be a derivative of anger rather than of disgust (see below). Obviously, this modification could only strengthen the case for Johnson-Laird and Oatley's STAL.

Concerning hypothesis 1, identical results were obtained for both types of judgements. For the 40 nondisjunctively defined emotions, I found that

in eight cases, the modal basic emotions were different from those postulated by Johnson-Laird and Oatley (1989). These cases covered, with the exception of contempt, all presumed derivatives of disgust (envy, jealousy, hate, guilt, shame, and humiliation), as well as boredom and helplessness. The modal basic emotion for envy, jealousy, hate, and humiliation was anger; for guilt it was sadness, and for shame, it was fear. Anger rather than sadness was the modal basic emotion for boredom, and fear rather than sadness the modal basic emotion for helplessness. In addition, in a substantial number of cases, a second basic emotion was nearly as prominent as the modal one. For example, in 5 of the 40 cases, the second most prominent basic emotion differed from the modal one by less than half a scale point on the conditional probability scale, and in 13 of the 40 cases, it differed by no more than a scale point. This finding further supports Jones and Martin's (1992) suggestion that people do not regard the basic emotions as mutually exclusive, as Johnson-Laird and Oatley (1989) originally proposed (but see Oatley & Duncan, 1992).

Also confirmed were the problems noted by Jones and Martin (1992) for the disjunctively defined nonbasic emotion words. First, for two of the eight relevant items (embarrassment and hurt), the two most prominent basic emotions were different from those proposed by Johnson-Laird and Oatley (1989). For embarrassment, the modal basic emotions were fear and anger rather than fear and disgust, and for hurt, the modal basic emotions were sadness and anger rather than sadness and fear (cf. Shaver et al., 1987, for similar findings). Secondly, there was no significant difference for the summed scale values between the eight disjunctively defined and the 40 nondisjunctively defined emotion words, $t(46) = 0.80$, n.s.

Concerning the second comparative hypothesis, I found that, even after the described "empirical correction" of Johnson-Laird and Oatley's (1989) STAL, there remained a substantial number of nonsemantic emotion relations which were at least as strong as ostensibly semantic ones. This result was obtained for both the conditional probability and possibility judgements, although the identity of the theory-discrepant items differed somewhat for the two types of judgements. To illustrate for the possibility judgements, the relation of despair to anger was at least as strong as were 36 (66.7%) of the 54 allegedly semantic emotion relations; the relations between despair-anger and hate-disgust were at least as strong as were 28 (51.9%) of the semantic relations; these two plus the relations between hopelessness-fear and contempt-anger were at least as strong as were 24 (44.4%) semantic relations, and so on down to the relation between hate and envy, which was no stronger than that between 97 semantically unconnected emotion pairs.

Extremity of the Judgements

A stricter test of Johnson-Laird and Oatley's (1989) STAL is provided by the absolute size of the judgements. If the proposed STAL is correct, one should ideally—that is, for competent speakers who make no performance errors—expect the subjects to indicate both (a) that, if one feels emotion A, one *always* also feels, simultaneously, the appropriate defining emotion B; and (b) that the experience of emotion A without the simultaneous experience of emotion B is *impossible*. Relevant to this prediction are primarily the data concerning the 40 relations between nondisjunctively defined nonbasic emotion words, and the basic emotions referred to in their definitions; and secondarily also the 14 examined relations among nonbasic emotion words. The results for the 40 relations

TABLE 1
Study 1: Frequency Distributions for Conditional Probability and Possibility Judgements

Conditional Probability Judgements ^a	F	%	Cum.%
[6–5] (always—in most cases)	9	22.5	22.5
[5–4] (in most cases—often)	26	65.0	87.5
[4–3] (often—occasionally)	4	10.0	97.5
[3–2] (occasionally—rarely)	1	2.5	100.0
[2–1] (rarely—never)	0	0.0	
	40	100.0	
Mean ^b	4.56		
Possibility Judgements ^c	F	%	Cum.%
[100–80]	10	25.0	25.0
[80–60]	12	30.0	55.0
[60–40]	14	35.0	90.0
[40–20]	2	5.0	95.0
[20–0]	2	5.0	100.0
	40	100.0	
Mean ^b	63.1		

^a Mean of subjects' judgements of nonbasic-basic emotion relations for the 40 nondisjunctively defined nonbasic emotion words.

^b Based on the ungrouped scores.

^c Percentage of subjects who regarded experiencing nonbasic emotion A without basic emotion B an impossibility.

between nonbasic and basic emotion terms are summarised in Table 1. Note that these analyses are again conservative in that each nonbasic emotion was once more treated as a derivative of its empirical, modal basic emotion.

As can be seen from Table 1, even after this “empirical correction” of Johnson-Laird and Oatley's (1989) STAL, the modal basic emotion was believed to be present at least *in most cases* (scale value ≥ 5) whenever a nonbasic emotion was present for only 9 (22.5%) of the 40 nondisjunctively defined nonbasic emotions. The majority of the nonbasic emotions (26, or 65%) had scale means ≥ 4 (*often*) but < 5 , and 5 emotions (12.5%) even had means < 4 . The average conditional probability judgement for the 40 items was 4.56, a value lying halfway between *often* and *in most cases*. Furthermore, the means of the judgements for the alleged semantic derivatives of happiness, sadness, anger, and fear did not differ significantly, $F(3, 35) = 1.71$, $P \approx 0.18$. (Disgust could not be included in this analysis because, after the “empirical correction” of STAL, only one disgust item—contempt—was left.)

As concerns the possibility judgements, there were only 10 cases (25%) on which at least 80% of the subjects agreed that one cannot experience the respective nonbasic emotion without the defining basic emotion and only 22 cases (55%) on which at least 60% agreed. Hence, for nearly half of the cases, at least 40% of the subjects thought that experiencing the nonbasic emotion without the presumably defining basic emotion is a real possibility. The average percentage of agreement across the 40 items was 63%. Again, there were no significant differences between the presumed derivatives of happiness, sadness, anger, and fear.

Finally, as to the 14 examined relations among nonbasic emotion terms, the results were even less favourable: Both the average conditional probability judgement (4.21) and the average proportion of rejection of the possibility item (0.39) for these emotion combinations were lower than those obtained for the 40 nonbasic-basic emotion combinations.

Discussion

Although there was some support for Johnson-Laird and Oatley's (1989) STAL, in that the modal emotions for the majority of nonbasic emotion terms agreed with those postulated by the authors, the total pattern of results was not very favourable.

First, even the just-mentioned, weak support must be qualified because (1) there was a consistent lack of support for the disgust-based definitions of nonbasic emotion words (except in the case of contempt); (2) for a substantial number of nonbasic emotions, a second basic emotion was nearly as prominent as the modal one; and (3) even after “empirical

correction" of the defining basic emotions, a substantial number of "nonsemantic" emotion relations remained equally strong or stronger than allegedly semantic ones. It seems difficult to argue that emotion word "A" is a semantic derivative of emotion word "B", if people believe that emotion A is related to a third emotion C nearly as strongly as, or even more strongly than, A is related to B, and/or other, ostensibly nonsemantic emotion relations (e.g. D-E) are equally strong or stronger than the relation of A to B.

Secondly, the *absolute values* of the judgements for most emotion terms fell considerably short of the "ideal" results predicted by the theory. However, as mentioned, these "ideal" results can only be expected for linguistically competent speakers who make no performance errors. Because this issue is relevant to all three studies, and because Study 3 was partly intended to examine it empirically, it is relegated to the General Discussion.

STUDY 2

Study 2 was a partial replication of Study 1, but with the important modification that, in contrast to the first study, *object-focused versions* of the test questions were used. To illustrate for the conditional probability judgements, instead of asking how frequently one feels sad if one feels remorse, I now asked how frequently one feels sad *about something* (the object of the emotion) if one feels remorse *about that same something* (see the Method section for more detail). This modification was based on my belief that Johnson-Laird and Oatley's (1989) STAL must hold not only for object-unspecified test sentences, but also for object-specified ones. That is, if STAL is correct, then people should, for example, not only say that whenever one feels remorse one also feels sad, but also that whenever one feels remorse about something (e.g. about not having helped a friend), one also feels sad about the very same thing. In my view, this follows from a principled attempt to account for object-related emotion talk in terms of Johnson-Laird and Oatley's theory.⁵ If this reasoning is correct, then object-focused sentences should in fact not provide only for an alternative, but for a sharper test of Johnson-Laird and Oatley's (1989) STAL than the object-unfocused ones used in Study 1. For it is conceivable that, at least for some emotions, the judgements obtained in Study 1 reflected generalised beliefs about emotion relations that were at least in part based on experiences involving co-occurring emotions directed at different

objects. For example, it is conceivable that in some or even all cases where both remorse and sadness are experienced, one feels, precisely speaking, remorse about somewhat different things (e.g. that one has not helped one's friend) than those about which one is sad (e.g. that one's friend suffered a negative outcome). If so, the Study 1 judgements would have given an inflated estimate of the strength of the relations perceived to exist between emotions directed at the same objects; and, as said, in my view only these latter relations are relevant to Johnson-Laird and Oatley's theory.

Method

Subjects

The subjects were 53 students of economics (28 female, mean age 24.9 years) at the Free University of Berlin. Three subjects had extremely deviant response profiles, suggesting that they did not take the task seriously but answered the response sheets in an essentially random fashion. These subjects were excluded, reducing the final sample size to 50 (23 for test 1 and 27 for test 2).

Method

Object-directed versions of a subset (62) of the test sentences of Study 1 were used (for each nonbasic emotion, only the modal basic emotion obtained in Study 1 was now used in nonbasic-basic emotion combinations). The objects of the majority of the included emotions are in my view best conceptualised as state of affairs, described by "that"-clauses (e.g. John is happy that he succeeded at the exam; cf. Gordon, 1974); but some emotions (e.g. love, hate, or contempt) seem to be more naturally construed as taking individual things, specifically persons as objects (cf. Reisenzein & Hofmann, 1990). In the former case, the test sentences for the conditional probability judgements were modified as follows: *If one has/feels [A] [preposition] something (X), then one _____ simultaneously also has/feels [B] [preposition] X*; e.g. "If one is proud of something (X), then one is _____ simultaneously also happy about X". For emotions which seem to take persons as objects, the test sentences read: *If one has/feels [A] [preposition] a person (P), then one _____ simultaneously also has/feels [B] [preposition] P*; e.g. "If one feels contempt for someone (P), then one simultaneously also feels disgust towards P". The test sentences for the possibility judgements were modified in an analogous manner. Two types of questionnaires containing, respectively, object-focused versions of test sentences 1 and 2 used in Study 1, were distributed to the subjects

⁵ This point is developed in more detail in a previous version of the manuscript, which can be obtained from the author on request.

during the last 30 minutes of a psychology course which they had to take as part of their study requirements. Each student completed only one type of questionnaire.

Results and Discussion

The interrater reliabilities for the mean conditional probability and possibility judgements, expressed by the intraclass correlation coefficient ICC[2,k] (Shrout & Fleiss, 1979), were 0.90 and 0.87, respectively.

If, as suggested in the Introduction to Study 2, the objectless judgements used in Study 1 were indeed partly inflated because they were based on beliefs about co-occurring emotions having different objects—leading to overly positive conclusions regarding the adequacy of STAL—one should

TABLE 2
Study 2: Frequency Distributions for Conditional Probability and Possibility Judgements

<i>Conditional Probability Judgements^a</i>			
	<i>F</i>	<i>%</i>	<i>Cum. %</i>
[6–5] (always–in most cases)	3	7.5	7.5
[5–4] (in most cases–often)	19	47.5	55.0
[4–3] (often–occasionally)	13	32.5	87.5
[3–2] (occasionally–rarely)	5	12.5	100.0
[2–1] (rarely–never)	0	0.0	
	40	100.0	
Mean ^b	4.02		
<i>Possibility Judgements^c</i>			
[100–80]	4	10.0	10.0
[80–60]	5	12.5	22.5
[60–40]	16	40.0	62.5
[40–20]	8	20.0	82.5
[20– 0]	7	17.5	100.0
	40	100.0	
Mean ^b	44.2		

^a Mean of subjects' judgements of nonbasic emotion relations for the 40 nondisjunctively defined nonbasic emotion words.

^b Based on the ungrouped scores.

^c Percentage of subjects who regarded experiencing nonbasic emotion A without basic emotion B an impossibility.

expect to obtain, at least for some emotions, lower conditional probability and possibility judgements with the object-focused versions of the test sentences. This hypothesis was confirmed (cf. Table 2): For the 40 nondisjunctively defined nonbasic emotions, both the mean of the conditional probability judgements (4.02; close to *often*) and the average proportion of rejection of the possibility items (44%) were significantly lower than the corresponding values obtained in Study 1 ($P < 0.05$). Separate *t*-tests for the 40 judgements revealed that 16 of the conditional probability judgements had significantly ($P < 0.05$) lower means in Study 2 than in Study 1 and that 18 of the possibility items were rejected by a significantly higher proportion of subjects in Study 2 than in Study 1 (the remaining means and proportions did not differ significantly). More detail is given in Table 2. As can be seen, for example, only for 3 of the 40 nondisjunctively defined nonbasic emotions (7.5%) was the presumably defining basic emotion thought to be present at least *in most cases* (scale value only ≥ 5) whenever the nonbasic emotion was present, and only in 22 cases (55%) was the basic emotion believed to be present at least *often* (scale value ≥ 4). Similarly, there were only 4 cases (10%) on which at least 80% of the subjects agreed that one cannot experience the respective nonbasic emotion without the defining basic emotion, and only 9 cases (22.5%) on which at least 60% agreed. Hence, for nearly 80% of the 40 most relevant emotion combinations, at least 40% of the subjects thought that it was possible to experience the nonbasic emotion without simultaneously experiencing the defining basic emotion. The results for the 14 relations among nonbasic emotion words were again worse: The mean conditional probability judgement was 3.05 (close to *occasionally*), and the mean proportion of rejection of the possibility items was only 20%.

If one accepts my suggestion that Study 2 constituted a sharper test of Johnson-Laird and Oatley's (1989) STAL than Study 1, one could therefore conclude that the results of Study 1 still gave a positively biased picture of the adequacy of that semantic theory. However, this conclusion must be regarded with caution, because the objects of the emotions were not *precisely* specified to the subjects, but were only abstractly described as "X". For "propositional" emotions, this raises the possibility that the subjects sometimes interpreted the two occurrences of "X" in a test sentence [e.g. "If one feels proud of something (X), then one is _____ simultaneously also happy about X"] as denoting two somewhat different, even though related, propositional objects (i.e. two somewhat different aspects of a complex event). If so, they might have refrained from answering "always" to the item just mentioned because they recalled a case where they, for example, felt proud that *they obtained a high grade at an examination*, but felt unhappy that *they had to dress up for the occasion* (I take this to be the gist of an objection raised by Keith Oatley and an

anonymous reviewer). It should be noted, however, that lower judgements were also obtained in Study 2 for nearly all of the 12 presumed hyperonym-hyponym emotion pairs where a *person* was specified as the object of the emotions and where a confusion of objects therefore seems unlikely (e.g. feeling contempt for P—feeling disgust for P). For example, the average percentage of subjects who considered it possible that one experiences emotion A but not B for these 12 emotion pairs was 50% in Study 1, but only 35% in Study 2.

STUDY 3

Study 3 had two purposes. The first was to test, in a more adequate way than was possible in Study 1, the hypothesis that ostensibly “semantic” emotion relations are stronger than “nonsemantic” ones. Recall that in Study 1, only the relations between the nonbasic emotions and four nondefining *basic* emotions were available to serve as nonsemantic relations in these comparisons. Because these form but a small fraction of all existing nonsemantic emotion relations—which consist of all possible $n(n - 1)$ relations among the n emotions minus the semantic ones—there could well be many further nonsemantic emotion relations, not examined in Study 1, that are equally strong or stronger than the allegedly semantic ones. To test this hypothesis, in Study 3 *all* of the 132 possible conditional probability and possibility relations existing between 12 selected basic and nonbasic emotions were assessed (using, with minor modifications, the two judgement tasks of Study 1). These included 11 semantic relations, which were then compared with the remaining, 121 nonsemantic ones.

The second purpose of Study 3 was to examine whether the results obtained in the previous studies, as well as any potential new results, would hold good if Johnson-Laird and Oatley’s (1989) STAL is tested in a different, but potentially more adequate way than in Studies 1 and 2. It can hardly be denied that the kinds of judgements used in Studies 1 and 2 are quite uncharacteristic of the everyday use of emotion words. Therefore, it could be argued that the semantic knowledge in question is—in contrast to my own and Johnson-Laird and Oatley’s (1989) assumptions—either not fully accessible by the test questions used in Studies 1 and 2; or else that this knowledge was for some reason simply not used by the subjects when answering these questions. To test this hypothesis, I examined whether the proposed semantic rules would reveal themselves more clearly in a more natural linguistic context. As mentioned in the Introduction, I think that the typical use of emotion words consists of the self- and other-ascription of emotion labels in concrete situations; therefore, I decided to examine such cases. Subjects were asked (a) to indicate their likely basic and nonbasic emotions in hypothetical scenarios designed to elicit the examined

emotions, and (b) the conditional probabilities of emotion word use were then calculated from these rating data. If nonbasic emotion words (e.g. “pity”) are indeed partly defined by means of basic emotions words (e.g. “sadness”), then competent language users should answer affirmatively to the question “Would you feel sad in this situation?” whenever they respond affirmatively to “Would you feel pity in this situation?”. If, in contrast, they regard “sadness” as an inappropriate label for some of the emotion instances for which they regard “pity” as appropriate, they cannot tacitly regard “pity” as a strict hyponym of “sadness”, just as somebody cannot be said to implicitly regard “female” as a necessary semantic component of “vixen” if he or she is unwilling to ascribe the predicate “female” to some of the objects which he classifies as vixens.

Method

Subjects

Subjects were 40 (21 female) introductory psychology students at the Free University of Berlin who participated in partial fulfilment of their course requirements.

Procedure

Because all possible pairwise relations between emotions were to be examined, only 12 emotions were studied: 3 basic emotions (happiness, sadness, and anger), and 3 groups of nonbasic emotions. The members of the first group (euphoria, contentment, thankfulness) are subforms of happiness according to Johnson-Laird and Oatley (1989), and those of the second group (disappointment, hopelessness, depression) are subforms of sadness. The remaining three nonbasic emotions (jealousy, hate, contempt) are postulated by Johnson-Laird and Oatley (1989) to be subtypes of disgust rather than of anger, as assumed here; however, according to the findings of Study 1 and cluster analytic results (e.g. Schmidt-Atzert & Ströhm, 1983; Shaver et al., 1987), with the possible exception of contempt these emotions are taken by lay subjects to be more closely related to anger.

For all possible pairwise combinations of the 12 emotions, the subjects performed the following types of tasks: (1) The object-unspecified conditional probability and (2) possibility judgements already used in Study 1; (3) ratings of the intensity with which they would experience each of the 12 emotions in 36 hypothetical scenarios (see later); and (4) judgements of emotion similarity. Because the similarity data are of secondary interest in the present context, they will not be considered further except for noting

that their means were very highly correlated with both the mean conditional probability (0.9) and possibility judgements (0.97; for more information, see Reisenzein & Schimmack, under review). The conditional probability scale was the same as that used in Study 1, whereas the possibility judgements were now also to be made on a graded scale ranging from 1 (*it is inconceivable that one experiences A but does not simultaneously experience B*) to 5 (*this is entirely conceivable*). This scale may be taken to measure the strength of belief that A without B is possible. To permit easier comparison of the two kinds of judgements among themselves and with the estimated conditional probabilities of self-ascriptions of emotion words (see later), the scales were subsequently linearly transformed into the range [0,1] and the possibility scale was additionally reversed, resulting in a transformed scale of strength of belief in the necessity of emotion B if emotion A.

The 36 scenarios were presented, together with the rating scales, in an entirely separate questionnaire. These scenarios were partly based on material obtained in a previous interview study (Reisenzein & Hofmann, 1993), partly they were newly constructed. Four each of the 36 scenarios were intended to elicit one of the 12 emotions as a dominant affect. An example of a thankfulness scenario is: "Recently I lost my briefcase in the subway. It contained my passport, ID, credit card and other papers. One week later I found everything in my mail box. Then I had the following feeling(s) . . .". The subjects were instructed to first check those emotions (from among the 12) which they would experience at all in a given scenario, and then to rate the intensity of the selected emotions on a scale ranging from 1 (*I would not experience the emotion at all*) to 7 (*I would feel the emotion very intensely*). The tasks were completed in random order over a period of two weeks.

For the probability and possibility judgements, matrices of means were computed, whereas the self-rating data were used to estimate conditional probabilities of self-ascriptions of emotion words. For this purpose, the rating scales were first dichotomised into emotion present (scale value ≥ 2) versus absent (scale value = 1). The conditional probabilities of self-ascriptions of emotion labels were then estimated from the pooled data consisting of 40 (subjects) \times 36 (scenarios) = 1440 cases, because the individual matrices did not contain sufficient data to permit reliable estimates. The scenarios were found to be generally well suited to elicit the intended emotions as dominant affects and hence, all emotions were checked frequently enough in the total sample as being present—from 114 times (jealousy) to 559 times (anger)—to permit reliable estimates of the conditional probabilities.

TABLE 3
Results of Study 3

Compared Emotions		Judgement of Conditional Probability P (B/A) ^a	Judgement of Possibility of A but not B ^b	Conditional Probability P (B/A) of Self-ascriptions of Emotion Words
A	B			
* Euphoria ^c	Happiness	0.88	0.89	0.94
Hate	Contempt	0.83	0.72	0.68
* Depression	Sadness	0.83	0.83	0.47
Hopelessness	Depression	0.81	0.77	0.76
Happiness	Contentment	0.79	0.66	0.54
* Hopelessness	Sadness	0.79	0.70	0.47
Depression	Hopelessness	0.75	0.74	0.46
(*)Hate	Anger	0.73	0.57	0.85
* Disappointment	Sadness	0.72	0.65	0.38
* Contentment	Happiness	0.71	0.58	0.75
Euphoria	Contentment	0.70	0.69	0.65
Thankfulness	Contentment	0.70	0.59	0.48
Sadness	Depression	0.69	0.62	0.53
(*)Jealousy	Anger	0.69	0.70	0.73
* Thankfulness	Happiness	0.69	0.65	0.86
Jealousy	Disappointment	0.68	0.71	0.75
Depression	Disappointment	0.68	0.49	0.68
(*)Contempt	Anger	0.65	0.53	0.81
* Contempt	Hate	0.64	0.49	0.50
Hopelessness	Disappointment	0.63	0.61	0.56
Jealousy	Sadness	0.62	0.65	0.36
Disappointment	Depression	0.59	0.43	0.51
Happiness	Euphoria	0.59	0.31	0.41
Sadness	Disappointment	0.59	0.50	0.55
Anger	Disappointment	0.58	0.26	0.51
Disappointment	Anger	0.55	0.46	0.59
Contentment	Thankfulness	0.54	0.42	0.34
Happiness	Thankfulness	0.53	0.41	0.44
Sadness	Hopelessness	0.53	0.41	0.32
Jealousy	Depression	0.52	0.49	0.38
Contempt	Disappointment	0.52	0.35	0.40
Hate	Disappointment	0.52	0.39	0.44
* Jealousy	Hate	0.50	0.43	0.20

^a Transformed scale with 0 = never, 0.2 = rarely, 0.4 = sometimes, 0.6 = often, 0.8 = in most cases, 1.0 = always

^b Transformed scale with 0 = entirely conceivable that A but not B; 0.25 = A but not B rather conceivable than not conceivable; 0.50 = unsure; 0.75 = A but not B rather not conceivable than conceivable; 1.00 = A but not B inconceivable.

^c For asterisk emotion pairs, B is a semantic component of A according to Johnson-Laird and Oatley (1989); emotions marked by parenthesised asterisks were assumed to be anger derivatives.

Results and Discussion

Interrater agreements according to the intraclass correlation coefficient for the reliability of mean ratings (Shrout & Fleiss, 1979) for both the conditional probability and possibility judgements were 0.99.

The results of Study 3 that are of main relevance to Johnson-Laird and Oatley's (1989) STAL are presented in Table 3, which contains, in decreasing order, the 33 emotion pairs with the highest values for the conditional probability judgements. These emotion pairs include the eight cases (marked by asterisks) of hyponym-hyperonym relations explicitly hypothesised by Johnson-Laird and Oatley (1989) covered by the comparisons examined in Study 3, as well as the relations between anger and the three potential anger hyponyms (hate, jealousy, and contempt) suggested by previous cluster analyses and the data from Study 1 (marked by parenthesised asterisks). Furthermore, the table contains all emotion pairs with mean perceived necessity judgements > 0.38 , and all but one of the emotion pairs with estimated conditional probabilities > 0.50 .

Conditional Probability and Possibility Judgements

The results of Studies 1 and 2 were conceptually replicated (see Table 3). The mean conditional probability judgement across the 11 presumed hyponym-hyperonym emotion pairs was 0.71 (between *often* and *in most cases*), and the mean possibility judgement was 0.64 (between *unsure* and *rather more inconceivable than conceivable*). Furthermore, the (untransformed) scale means of the individual conditional probability judgements were extremely similar to those obtained for the corresponding judgements in Study 1, in which the same type of object-unfocused questions had been used.

The comparison of the judgement means for the 11 semantic emotion relations with those for the 121 nonsemantic ones revealed again that a substantial number of semantically unconnected emotions were at least as strongly related as were semantically connected ones. Because these results were fairly similar for the two types of judgements (cf. Table 3, columns 3 and 4), I will restrict their discussion to the conditional probability judgements. As shown in Table 3, the relation of hate to contempt was at least as strong as that between 10 of the 11 presumed hyperonym-hyponym pairs (marked by asterisks); hate-contempt, hopelessness-depression, and happiness-contentment were at least as strongly related as were 9 of the 11 postulated hyponym-hyperonym pairs; these 3 plus depression-hopelessness were at least as strongly related as 8 proposed hyponym-hyperonym pairs; and so on, down to the relation of jealousy to hate, which was no stronger than that between 22 nonsemantic emotion pairs. Because

only two of the theory-discrepant nonsemantic emotion relations (jealousy-sadness and disappointment-anger) were relations between nonbasic emotions and nondefining *basic* emotions (cf. Study 1), these results confirm my suspicion that many of the nonsemantic emotion relations not examined in Study 1 are also equally strong or even stronger than allegedly semantic ones. Hence, the actual degree of overlap between the distributions of judgements for semantic and nonsemantic emotions relations seems to be much greater than suggested by the results of Study 1.

Two types of the newly found theory-deviant semantic-nonsemantic comparisons are particularly problematic for Johnson-Laird and Oatley's STAL:

1. In two of the 11 cases, the relation between nonbasic and their defining basic or other nonbasic emotions was weaker than the *converse* relation: The judged conditional probability of happiness, given contentment (0.71), was lower than that of contentment, given happiness (0.79), and that of hate, given contempt (0.64) was lower than that of contempt, given hate (0.83). Both differences were significant [$t(39)$, $P_s < 0.05$ and < 0.001 , respectively]. For the remaining 9 cases, the differences between the postulated and the converse relations were generally small. On average, the 11 semantic relations were only about 1 scale point (on the original scale) higher (0.71; between *often* and *in most cases*) than the converse relations (0.56; between *sometimes* and *often*).

2. In four of the 11 relevant cases, the nonbasic emotions were at least as strongly related to other, semantically unconnected *nonbasic* emotions as to their allegedly defining basic or nonbasic emotions: Hopelessness was more strongly related to depression (0.81) than to sadness (0.79); hate more strongly to contempt (0.83) than to anger (0.73; $P < 0.05$); thankfulness more strongly to contentment (0.70) than to happiness (0.69); and jealousy more strongly to disappointment (0.68, $P < 0.01$), sadness (0.62), and depression (0.52) than to hate (0.50).

Conditional Probabilities of Self-ascriptions of Emotion Words

As can be seen from the last column of Table 3, the hypothesis that the semantic relations between emotion words postulated by Johnson-Laird and Oatley (1989) would be more clearly revealed by self-ascriptions of emotion labels in concrete situations was not supported. Rather, the findings were fairly similar to those obtained for the direct conditional probability judgements: The correlation between the two variables (across all 132 items) was 0.93, and the mean of the estimated conditional

probabilities for the 11 semantic emotion pairs was 0.63. As can be expected from this, the results obtained on this index for the comparisons between semantic and nonsemantic emotion relations were also similar to those obtained for the direct judgements.

GENERAL DISCUSSION

In three studies devoted to an investigation of the semantic theory of emotion words proposed by Johnson-Laird and Oatley (1989), I found that:

1. With the exception of contempt, the analysis for the proposed derivatives of disgust was consistently unsupported (Study 1).

2. Even after the proposed STAL was “empirically corrected” (i.e. after the modal basic emotion of each nondisjunctively defined nonbasic emotion was substituted for the defining basic emotion proposed by Johnson-Laird & Oatley, 1989), the conditional probability and possibility relations between ostensibly semantically connected emotions were frequently no stronger or even weaker than those between semantically unconnected ones: In several cases, nonbasic emotions were empirically related to their defining (basic or other nonbasic) emotions: (a) no more or even less strongly than vice versa (Study 3); (b) no more or even less strongly than to other basic (Study 1) or nonbasic emotions (Study 3) not used in their definition; and (c) no more or even less strongly than a variety of other semantically unconnected emotions were related among themselves (Studies 1, 3).

3. In a substantial number of cases, a second basic emotion was nearly as prominent as the modal basic one (Study 1).

4. The absolute size of the conditional probability and possibility relations perceived to exist by lay people between nonbasic emotions and their defining basic or other nonbasic emotions fell substantially short of the “ideal” results predicted by the semantic theory (Studies 1, 2, and 3).

5. This deviation from predictions was particularly pronounced if object-focused versions of the tests were used; pointing to the possibility that the object-unfocused judgements used in Studies 1 and 3 were partly inflated because they reflected co-occurring emotions directed at different objects (Study 2; but recall the qualifications of this conclusion in the Discussion of Study 2).

6. No more favourable results were obtained when Johnson-Laird and Oatley’s STAL was tested in the more common linguistic context of self-ascriptions of emotion words in concrete situations (hypothetical scenarios; Study 3).

In the rest of the General Discussion, I first consider possible methodological problems that could have been responsible for the obtained

discrepancies between the predictions derived from Johnson-Laird and Oatley’s (1989) STAL and the data, and then discuss the implications of the findings for their semantic theory, as well as their theory of emotions.

Methodological Issues

As previously mentioned, the “ideal” results predicted by Johnson-Laird and Oatley’s (1989) STAL can be expected to be obtained only for competent language users who make no performance errors. Therefore, before any further-reaching conclusions are drawn, the possibility must be examined that lack of linguistic competence or performance problems were responsible for the obtained discrepancies between theory and data.

Concerning the possibility that the participants of my studies lacked sufficient linguistic competence, I can only point out that—given that all of them were university students who spoke German as their first language—their linguistic ability was, if anything, most likely above that of the average population. One might want to hold that average language users are *generally* unsuited for the validation of a linguistic theory (at least that investigated here); however, this assumption comes dangerously close to an immunisation of that theory against empirical evidence, or at least to a restriction of its domain of application to the point where it becomes uninteresting (cf. Reisenzein, 1990; Reisenzein et al., 1992).

A possibility that must be taken more seriously is that the subjects’ tacit knowledge of the proposed definitions of emotion words, although present, could not fully reveal itself in their judgements for various performance-related reasons. Possible performance errors include: (1) relatively “superficial” errors caused by carelessness, inattention, and oversight; (2) errors due to systematic response tendencies, specifically a tendency to avoid extreme response categories (conditional probability judgements) or a tendency to prefer “yes” answers (possibility judgements, Studies 1 and 2); and (3) errors caused by inadequate testing or assessment procedures.

It is, of course, hardly questionable that *some* amount of performance error was present. However, I think that this error was neither sufficiently large nor sufficiently systematic to explain the obtained discrepancies between theory and data. Concerning (1), an estimate of the amount of “superficial” performance error present in the data is provided by the subjects’ answers to the item concerning the relation between rage and anger (Studies 1 and 2), because this relation can a priori be regarded as being most likely analytical in character (if any one can). In line with this assumption, nearly all of the subjects indicated that one feels always angry if one feels rage (the mean conditional probability judgements were 5.88 in Study 1 and 5.50 in Study 2); and all participants of Study 1 and all but 2 (93%) of Study 2 held that it is impossible to feel rage without simulta-

neously also feeling anger. This is certainly too small an error to explain the substantial observed discrepancies between theory and data. Furthermore, for the results to be attributed to such performance errors, one would additionally have to make the implausible assumption that the size of these errors varied systematically for different items.

Analogous considerations apply to (2), systematic response tendencies. Had such tendencies been responsible for the observed discrepancies between theory and data, one should have expected that they manifested themselves also in the case of the rage-anger item mentioned above, which was obviously not the case; and one would also have to assume that they were differentially effective for different items, ranging from no to very strong influences. Furthermore, concerning specifically the tendency to avoid extremes, one would additionally have to assume that this tendency was one-sided in Study 1, because the distribution of scale values of the conditional probability judgements (across all items) was markedly right-skewed, i.e. the lowest scale values were used most frequently. In my view, these are just too many *ad hoc* assumptions to make this alternative explanation very plausible.

Finally, one might want to attribute the obtained discrepancies between theory and data to the specific methods used to elicit the semantic knowledge in question. Several considerations speak against this possibility, however. First, the investigation of subjects' use of emotion words in a relatively natural linguistic context (self-ascriptions of emotion labels in hypothetical scenarios; Study 3) led to similar conclusions as the study of their word use in the context of generalised probability and possibility judgements. Secondly, other evidence (e.g. Hampson, John, & Goldberg, 1986) suggests that, provided that a semantic field does indeed contain strictly hierarchical relations (such as words for biological taxa), the methods used in my studies (e.g. "Is it possible that something is a bird but not an animal?") would be entirely suited to detect these relations. Thirdly, although a number of other methods for eliciting subjects' hierarchical semantic knowledge have been proposed, such as similarity judgements (e.g. Shaver et al., 1987; cf. the present Study 3) or judgements of category breadth or of concept asymmetry (Hampson et al., 1986), none of these methods appears to be substantially more promising than those used in the present studies. For example, concerning similarity judgements, Hampson et al. (1986) and Tversky and Hutchinson (1986) have noted that a characteristic feature of such judgements is that they sound linguistically odd when applied to hierarchical relations (e.g. "Robins are similar to birds"). This is also the case for unquestionably hierarchically related emotion words (e.g. "test anxiety is similar to anxiety"). In contrast, for the hierarchical relations proposed by Johnson-Laird and Oatley (1989), similarity judgements appear quite natural (e.g. "depression is similar to sadness"; "pride is

similar to happiness"; "frustration is similar to anger"). Concerning judgements of category breadth and concept asymmetry, some relevant data were collected by Storm, Storm, and Ratchford (1987/88) in a study that was brought to my attention after the present research had been completed. Forty pairs of emotion words were judged, including five that, according to Johnson-Laird and Oatley's STAL, stand in a hyponym-hyperonym relation (satisfaction-happiness; disappointment-sadness; despair-sadness; frustration-anger; terror-fear). On average, 70.2% of the subjects selected the basic term as being broader in meaning, and 64.8% said that statements of the form "[Nonbasic emotion] is a kind of [basic emotion]" were more meaningful and made more sense than the converse statements. These data are broadly in agreement with the present results.

In addition, it must be emphasised that, even if the mentioned factors could, alone or in combination, account for the less than perfect *absolute* judgements, it is much less clear how they could explain the obtained discrepancies between theory and data concerning the *relative* strength of the emotion relations obtained in Studies 1 and 3 (comparable findings were also reported by Storm et al., 1987/88).

I feel therefore justified in concluding that the results of the present studies constitute, at least, good prima-facie evidence against Johnson-Laird and Oatley's (1989) STAL. That is, the evidence seems to be strong enough to warrant scepticism regarding this STAL until positive empirical evidence for it, as well as plausible, empirically substantiated explanations for the present discrepant results are presented by its proponents. I feel additionally reinforced in this conclusion by the following considerations. (1) There is a plausible alternative explanation of the present findings, that also accounts for the (apparent) weak support for Johnson-Laird and Oatley's (1989) STAL obtained in the present studies, as well as for STAL's intuitive basis: namely, that the obtained data reflect primarily, beliefs about *empirical covariations* of emotions, and that Johnson-Laird and Oatley (1989), being influenced by their a priori theory of basic and nonbasic emotions, misinterpreted these beliefs about empirical covariations as beliefs based on semantic relations (as did Descartes before them). (2) There exist alternative semantic theories of emotion words which do not attempt to reduce all emotion words to a few basic ones and which are, in my view, at least as plausible as is Johnson-Laird and Oatley's (1989) STAL (e.g. Mees, 1985, 1991; Wierzbicka, 1972, 1992).

Beyond their importance for Johnson-Laird and Oatley's (1989) STAL, the present findings are also relevant to other semantic theories of the affective lexicon which assume a hierarchical structure (e.g. Schmidt-Atzert & Ströhm, 1983; Shaver et al., 1987). The present data suggest that strictly hierarchical structures in the affective lexicon may be far less

common than has been assumed by these authors (see also, Bandelt, Scholz, & Wetzel, 1991).

Implications for Johnson-Laird and Oatley's STAL and their Theory of Emotions

Assuming, for the time being, that Johnson-Laird and Oatley's (1989) STAL is substantially amiss, can one conclude from this that Oatley and Johnson-Laird's (1987) theory of emotions is also in error? By their own premisses concerning the relation between emotions and emotion language, it would indeed seem that one can. For Johnson-Laird and Oatley (1989) obviously assumed that the structure of the affective lexicon reflects the structure of emotions well enough to allow them to take their own, intuitive analysis of emotion words as confirmative evidence for their theory of emotions. By the same token, they should regard a disconfirmation of their STAL as a disconfirmation of their emotion theory.

However, Johnson-Laird and Oatley are not forced to accept this conclusion. They could, instead, weaken their assumptions concerning the degree of precision with which emotion structure is mapped into language. That is, they could assume that, even though people *feel* in accord with their theory of emotions, they have only limited knowledge (including tacit knowledge) of this fact. On the basis of this assumption, the authors could then attempt to modify their STAL in ways that bring it into closer correspondence with the present, empirical linguistic data, but at the same time leave their theory of emotions unscathed.

For example, (1) Johnson-Laird and Oatley could abandon their assumption that their *basic* emotion words (such as "sadness") denote just "raw feels"; instead, they could assume that these words, too, refer to complexes of feelings and appraisals (this possibility was suggested to me by Nico Frijda). On one possible reading of this proposal, all emotion terms, including basic ones, are in truth classically defined nonbasic terms. To illustrate, "sadness" might be defined in ordinary language as "the basic feeling quality SADNESS caused by the belief that one has suffered a loss". People who are asked how frequently one feels sad when one experiences pity would then have to examine not only whether the basic feeling quality SADNESS is present in cases of pity, but also whether a loss appraisal is present; and assuming that this appraisal is not always present, they should refrain from saying that pity is always associated with sadness. Conversely, (2) the authors could abandon their assumption that *nonbasic* emotion words are classically defined. Instead, they could assume (a) that all emotion concepts, including nonbasic ones, have a "probabilistic" definition, that is, are mentally represented exclusively by non-necessary features (Smith & Medin, 1981), for example, in the form

of a prototype or script (cf. Russell, 1991; Shaver et al., 1987); and (b) that the characteristic semantic features of nonbasic emotion words include, with differing conditional probabilities, terms for basic emotions. Finally, (3) Johnson-Laird and Oatley could assume that knowledge about emotion relations is not explicitly stored in memory at all. Instead, they could assume that this knowledge is only implicitly present in their memories of concrete exemplars of emotions (see Conway, 1990), and that people therefore have to "compute" the conditional probabilities of emotion occurrence from their knowledge of exemplars (cf. Schimmack & Reisenzein, under review).

The viability of these possible modifications of Johnson-Laird and Oatley's (1989) STAL cannot be discussed in detail here. However, I think that when one attempts to carry them through in detail, all of them are likely to encounter serious problems. For example, the just-mentioned exemplar theory of the representation of emotion interrelations is in my view unsuited for Johnson-Laird and Oatley's purposes (cf. also the General Introduction). A probabilistic view of nonbasic emotion concepts has to cope among others with the problem of explaining why—if nonbasic emotions are indeed complexes of appraisals and basic feelings—people have not long since recognised this fact and incorporated it into their semantic knowledge base. And the proposal to define basic emotion words by analogy with nonbasic ones leaves unclear what other *ordinary language* words denoting "raw feels" (e.g. which ordinary language substitutes for the place-holder "SADNESS" in the above definition of "sadness") should be used in the definition of emotion words. In addition, according to Johnson-Laird and Oatley, it is an important characteristic of basic emotion terms that they can be used to denote objectless feelings; if even the basic emotion terms denote appraisal-feeling complexes, this should be impossible.⁶

Finally, even if one grants to Johnson-Laird and Oatley (1989) that the mentioned, or further conceivable modifications of their STAL are successful in the sense that they bring that semantic theory into closer correspondence with the present findings without compromising their theory of emotions, there remains the following problem: At least as long as one restricts one's attention to the dependent variables investigated

⁶ As W. Garrod Parrott pointed out to me, Frijda's proposal could be interpreted in a different way that escapes at least the first of these two problems: namely, one could assume that the feeling components of emotions are not lexicalised in ordinary language, but (as I understand Parrott) are exclusively represented by concepts of a "mental language". This proposal deserves to be further investigated; however, as far as I can see, it still faces the second of the two problems mentioned.

in the present studies, the empirical predictions derived from such a modified STAL will no longer significantly differ from those that can be derived from the simpler hypothesis, proposed above, that the findings reflect largely beliefs about covariations of emotions. Hence, what Johnson-Laird and Oatley would have to show is not only that their STAL, if appropriately modified, can be brought into agreement with the present empirical results; they would also have to make plausible why their semantic explanation of the findings is superior to the alternative, "covariation" explanation proposed here (see also Shimmack & Reisenzein, under review).

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