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Chapter 1
Using SDRT to analyze pathological conversations Logicality, rationality, and pragmatic deviances*

Manuel Rebuschi and Maxime Amblard and Michel Musiol

1.1 Introduction

Schizophrenia is well-known among mental illnesses for the severity of the thought disorders it involves, and for their widespread and spectacular manifestations ranging from deviant social behavior to delusion, not to mention affective and sensory distortions. The goal of this paper is twofold: (i) to discuss how the concepts of rationality and logicality may apply to conversational contexts in which one of the speakers is schizophrenic, and (ii) to present the initial steps of a scientific research project on one specific manifestation, namely disorders in conversational speech.

Our data are taken from transcriptions of real conversations between a psychologist and a schizophrenic patient. Data collection and selection relied on theoretical hypotheses from psychiatry and psychopathology. Confronted with such a pathological conversation, any "ordinary" speaker intuitively feels that there are some incoherencies or discontinuities. The aim of this research is to account for these using both pragmatics and formal semantics. Linguistics, especially semantics and pragmatics, is thus central to this work. Moreover, since speech incongruities raise the issue of the nature of rationality and its connections with logicality, the interpretative part of our research is naturally related to fields such as philosophy, philosophy of mind, and philosophy of logic.

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* This paper aims to present an overview of ongoing interdisciplinary research that started with the DiaRaFor project at the MSH Lorraine in Nancy. Certain materials have already been collected in [29] and [1]. We are grateful to the audiences at JSM 2010 and CAuLD (Nancy, 2010), MSH-Alpes (Grenoble, 2011), and TALN 2011 (Montpellier, 2011), where versions of this paper were presented. We wish to thank Bruno Ambroise, Valérie Aucoututier, Denis Bonnay, and Eric Grillo for their critical comments and helpful suggestions.

This paper is organized as follows. In Section 1.2, we discuss the relationships between logicality, rationality, and schizophrenia. This reflection then leads us to a specific strategy to account for pathological conversations, based on semantic and pragmatic theorizing. In Section 1.3, we briefly present the theoretical background both psycholinguistic and formal of our empirical analyses. Section 1.4 introduces the corpus: the choice of participants, i.e. schizophrenic patients, and the procedure followed from live conversation and transcription to the selection of relevant excerpts, as well as the formal framework used to construe conversations. In Section 1.5, we provide two example analyses. Lastly, in our conclusion, we discuss a few epistemological implications of our research.

1.2 Logic, Rationality, and Schizophrenics

The delirium of schizophrenia is marked in psychiatry as one of the most radically deviant forms of thinking. Schizophrenia is often approached based on analysis of verbal productions (scales, tests, experiments) and patient speech. Should we consider that insanity means a complete loss of logicality or rationality? Does assuming so help us understand schizophrenia? In this section, we shall explain why not.

1.2.1 Interpretation and Charity

Can we understand insanity? In the most radical of schizophrenic delusions, this seems impossible when referring to the classical canons of rationality. Denial of reality and seemingly contradictory thoughts, which are characteristic of the disease, would urge us to give up. Should we thus content ourselves with a purely external third-person approach to the mental life of insane persons?

We will argue against this impossibility. We do not deny the relevance of explanations from the third-person point of view, such as neurobiology, psychoanalysis, etc. What we reject is the hypothesis that reductionist explanations can completely account for insanity. We claim that insanity does not exclude rationality in the subject, even if it is deviant rationaliy. Consequently, a first-person perspective on such illnesses is defensible.

The principle of charity

In order to address the question of rationality (and logicality) in schizophrenics, we will start with a discussion of the principle of charity. Quine [28], and later Davidson [11], have defended the need for the principle of charity in mutual interpretation. The idea is to maximize the truth of others' beliefs, but above all to assume their consistency, i.e. their logical non-contradiction. The so-called principle of charity actually includes several variants, which we can cite from highest to lowest:

– A postulate of *strong logicality*: the person interpreted is consistent with classical logic;[2]
– A postulate of *weak logicality*: the person interpreted is consistent with the principle of contradiction (i.e., she does not simultaneously allow *A* and non-*A*);
– A postulate of *rationality*: the person interpreted is rational.

One can obviously defend the principle of contradiction without adopting classical logic,[3] and this is why we have labelled the first two versions, respectively, "strong" and "weak". Following the assumption of logicality in its weak version, the subject complies with the principle of contradiction, but nothing is said about her general logic that can be non-standard. The postulate of rationality is itself relatively independent from the assumption of logicality, since one can consider a subject who does not comply with the latter even in its weak version, and hence who does not respect the principle of contradiction, but who would nevertheless be judged *rational*.[4]

Quine has defended the need for the principle of charity as strong assumption of logicality in a context of "radical translation", i.e. in some hypothetical and ideal situation where an anthropologist meets people who have had no previously contact with the outside world:

> To take an extreme case, let us suppose that certain natives are said to accept as true certain sentences translatable in the form '*p* and not *p*'. Now this claim is absurd under our semantic criteria ... Wanton translation can make natives sound as queer as one pleases. Better translation imposes our logic upon them, and would beg the question of prelogicality if there were a question to beg. [28, §13]

But the principle should go back home. The translation (i.e. the interpretation in which we project our own assumptions) is not so much used with the Indians of a particular tribe as with people around us, who are apparently speaking the same language as us:

> That fair translation preserves logical laws is implicit in practice even where, to speak paradoxically, no foreign language is involved. Thus when to our querying of an English sentence an English speaker answers 'Yes and no', we assume that the queried sentence is meant differently in the affirmation and negation; this rather than that he would be so silly as to affirm and deny the same thing. ... [O]ne's interlocutor's silliness, beyond a certain point, is less likely than bad translation – or, in the domestic case, linguistic divergence. [28, §13]

Interpretation and the possibility of rival and incompatible interpretations also arise in this more familiar case because, to put it simply, there is no (empirical) *fact* to determine the meanings our interlocutors want to communicate to us. According to Davidson, assuming rationality and logicality is thus a precondition for understanding others:

> Crediting people with a large degree of consistency cannot be counted mere charity: it is unavoidable if we are to be in a position to accuse them meaningfully of error and some degree of irrationality. Global confusion, like universal mistake, is unthinkable, not because imagination boggles, but because too much confusion leaves nothing to be confused about and massive error

[2] Of course, it is not required that subjects reason as through deductions within some logical calculus, but that their reasoning tend to conform to the standards of classical logic.

[3] Most non-classical logics (relevance logic, intuitionistic logic, etc.) nonetheless retain the principle of contradiction.

[4] We provide no precise definition of rationality here, but merely rely on usual mutual attributions of rationality by subjects in interaction. Such attributions are generally based on the observation of behavioral coherence, the defeasible assumption of a minimal amount of shared background beliefs and ways of reasoning, or other implicit criteria.

> erodes the background of true belief against which alone failure can be construed. ... To the extent that we fail to discover a coherent and plausible pattern in the attitudes and actions of others we simply forego the chance of treating them as persons. [11, 221–222]

The justification of the principle of charity is then not only methodological, i.e. the principle is not only made indispensable for interpretation. It is also a conceptual justification, in the sense that rationality is here conceived of as constitutive of (the concepts of) true beliefs as well as subjects' other attitudes (see [3]).

Understanding insane people

The issue is, now, what happens when our interlocutors are insane? Very often, what insane persons are saying is not considered serious, and whay they say is not even considered to be taken seriously for a good analysis of insanity. The dominant views are indeed *reductionist*. According to such views, insanity should be *fully* explained either by brain dysfunction (neurobiological or genetic reductionism), or by the subconscious (psychoanalytic reductionism). The explanation is then constrained to an external *third-person* perspective on the subject. The intended analysis is that of a causal explanation. If there is a kind of rationalization of insanity via the analysis, the only rationality at work is that of the psychologist. A psychiatrist and a linguist assumed the same hypothesis in the early 80's according to some experimental research [30].

The American philosopher and psychologist Louis A. Sass [32, 33] challenges these reductionist approaches and defends an analysis that takes into account the internal, *first-person* point of view. The issue is not only to explicate but also to *understand* what motivates the insane in terms of *reasons*. This means acknowledging *the subject's rationality*, in contrast to what appears in the standard diagnostic criteria in psychiatry (see the critique of DSM-IV by Henriksen [16]).

This first-person approach was seen by Wilhelm Dilthey [14] as the only appropriate one for the "sciences of the mind" (*Geisteswissenschaften*). Let us emphasize that it is perfectly *compatible* with the explanations offered in the third-person perspective by neurobiology and/or genetics, which are dominant in psychiatry. It is our intention neither to verify the value thereof, nor to discuss the classification of psychiatric disease summarized in the DSM. What we take issue with is *reductionism*. We dispute the idea that the perception of the illness can be fully supported by third-person explanations.

Understanding the insane involves adopting their rationality, but their rationality is deviant. Where should we locate such a deviance? We will focus on schizophrenia, a pathology giving rise to the most radically deviant delusions and inconsistencies. While speaking of the insane's *rationality*, especially about schizophrenics, we assume, in part, the principle of charity.

Schizophrenic persons are *apparently* contradictory. This is what emerges from the analysis of conversations with schizophrenics. There are frequent conversational *breaks* or discontinuities. In some cases, these breaks occur at times when, clearly, the schizophrenic *appears* to accept (and generate) contradictory judgments. How can we account for this?

1.2.2 Locating failures

Locating conversational breaks depends on perspective. From the "ordinary" speaker's point of view, failures are spontaneously placed in semantics and seen as a mere contradictions. However, postulating logicality for schizophrenics leads us to take into account their own viewpoints on conversation, where failures must be grounded elsewhere.

The semantic content

If we follow Quine and his conception of the principle of charity, wherein rationality is synonymous with (first-order) classical logic, that is to say where charity is designed as a postulate of strong logicality, we have the choice between:[5] (1) considering that the principle of charity is not valid in the case of schizophrenics, but then denying them any rationality and returning to the reductionist approaches mentioned above, thus renouncing understanding, and (2) considering the principle of charity as fully applicable, i.e. that subjects are logical and even classical, but that schizophrenics do not understand the meaning of words as we do and that we do not have translation manual between their language and ours, which makes understanding them impossible for us.

One can challenge Quine's conception of charity and follow Graham Priest [27], for whom the postulates of logicality (strong or weak) and rationality must be separated. The schizophrenic would be rational, but she would not be logical in the sense of conforming to classical logic. She would not even comply with the principle of contradiction. She would have a different logic, a *paraconsistent* one, tolerant to contradictions. This would account for the fact that delusion sometimes seems to have formal meaning for the subject (in a first-person perspective), even though we consider that this is insanity, and hence non-logical thought (in a third-person perspective). This duality of perspectives results in a logical duality. Priest would certainly be very unhappy to learn that paraconsistent logic is restricted to the thought patterns of schizophrenics, but this is incidental to our purpose. However, according to this position, one comes to take on different logics between insane and not insane at least when they converse together. This also leads us to consider that we, who are not insane, cannot understand the insane, simply because we do not have the same logic they have.

In his 1910 study of the principle of contradiction in Aristotle, Łukasiewicz [19] advocates the idea that the psychological version of the principle of contradiction should be empirically tested, but not proven *a priori*. The psychological version of the principle of contradiction is the impossibility of having *contrary beliefs*, i.e. the impossibility of beliefs whose contents are contradictory judgments (A and not-A). Schizophrenics would thus show at little cost that the psychological principle of contradiction does not hold (in respect to themselves at least).

But this is moving a little fast. Łukasiewicz draws on a naive epistemology. If we are to determine empirically vs. *a priori* the validity of the principle, we must assume some kind of *raw psychological facts*. But in psychology as elsewhere there are no such raw facts: psychological facts are theory-laden, that is to say that the data are always inter-

[5] This is not the place to discuss the positions that Quine might have defended, but rather to see what positions are consistent with his strong conception of charity.

preted in terms of our theoretical assumptions. Regarding the phenomenon of apparent contradiction, the question of the location of the inconsistency remains open.

The presentation of content

In line with other theorists, Louis Sass [32] denies that the *reality-testing deficit*, usually included among the symptoms of schizophrenia, adequately characterizes the thinking of schizophrenic subjects. The reality-testing deficit is an impermeability to reality that would result in the production of false and contradictory beliefs. Sass disputes this notion since it brings the deficit to the *content* of mental states, whereas we should consider that the defect involves the *states* themselves. To put it in other words, what is at stake is the mode of presentation of the content rather than the content itself. According to Sass, where we see *beliefs*, the schizophrenic entertains *states* of a type far less committed vis-à-vis reality. For Campbell [6], these are *framework propositions*, a concept which can be approached through Searle's *background capacities* [34, 16].

According to Sass, the mental attitude of schizophrenics is closed to that underlying philosophical solipsism as per Wittgenstein. Let us call *schizo-beliefs* such belief-like attitudes of schizophrenics. The idea is that, far from objectifying the contents of her schizo-beliefs, the subject would tend to subjectivize them, that is to say, to deny them any genuine status. This is consistent with a widespread questioning of perceptions implied by the radical skepticism of solipsism. The delusional thoughts and states resulting from perceptions are treated in the same fashion, as schizo-beliefs rather than beliefs.[6]

How does playing on the container (the type of mental state) empty the content of contradictions? This is difficult to describe here since schizo-beliefs are characteristic of schizophrenic thinking. They belong to a type of mental states that non-schizophrenics do not have, which explains the difficulty of understanding (e.g. by empathy) schizophrenic subjects.[7] Our proposal is to account for the first-person perspective using third-person methods, in a way similar to Dennett's *heterophenomenology* [13].

However, we can try to illustrate the issue using a type of custom-built deviant mental state that cannot be found anywhere. Such states would generate contradictions in content in cases where normal mental states would not. Let us call this imaginary kind of mental state *imadaynation*. This state lasts one day and corresponds to imagination continuous over time, say until the next phase of sleep. If I *imadayne* now that it's raining, that means I imagine that it is raining until tonight. So if I *imadayne* it is raining, and a minute later I *imadayne* it is *not* raining, I will thus entertain *imadaynation* states whose contents are contradictory. Whereas if I never *imadayne* anything, but just imagine, then I can imagine it is raining, a minute later imagine it is not raining, and not have (imagination)

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[6] It is noteworthy that this point converges with formal approaches to contradiction by paraconsistent logicians. E.g. Villadsen proposes an analysis of paraconsistent assertions whose principle is to suspend judgment on a claim (by assigning them an indeterminate truth value). This strategy makes it possible for contradictory assertions to coexist (see [37, 106]).

[7] The idea that understanding requires empathy underlies the alternative to the principle of charity proposed by Bonnay and Cozik [3]. They argue that cognitive science suggests that our understanding of others is mainly based on simulation mechanisms. However, in the case of schizophrenia, the subject's strangeness is such that simulation can not work. So here we defend a conception of the first-person perspective which does not require empathy or simulation.

states whose contents are contradictory. In short: *the type of state in question is crucial in determining whether the contents of two states are contradictory or not*. Just as the same contents imagined produce no contradiction, whereas they produce one when *imadayned*, we must conceive that the same content, even though contradictory as contents of beliefs, would cease to be contradictory if they were the contents of schizo-beliefs.

Pragmatic inconsistencies

The strategy we will develop for the analysis of conversations is not based on a new classification of mental states. However, we agree with Sass that the problem of schizophrenic thinking, as expressed in conversation, is not a problem of inconsistency of content. We postulate that schizophrenic speakers perfectly conform to classical logic; hence we assume that the principle of charity à la Quine obtains in their case too.[8] But we place the deviance of rationality in the *rules of language use*, i.e. in language conventions of rhetorical and pragmatic types.

What emerges from our approach differs from Brunet's [4] idea that the separation between reasoning (dynamic processes involving states) and argument (logically binding contents) must be modeled on the distinction between, respectively, third-person point of view and first-person perspective. In our conception, the first-person view, which aims to account for a subject's rational thinking, is irreducible to a mere evaluation of contents. The way contents are structured (for a particular type of mental state in Sass's approach to delusion, by such and such pragmatic relations in the analysis of pathological conversations we develop) is an essential component of rationality. In short, rationality is not reducible to logicality.

Our empirical analyses focus on transcripts of conversations between a schizophrenic subject and a psychologist (ordinary subject). Conversations lead to breaks which are perceived by ordinary subjects, but not necessarily by the schizophrenic interlocutor causing them. The analysis involves constructing representations of conversations based on the formalism of SDRT, briefly presented in the next section. These representations include two levels: semantic representation (i.e. the content of the conversation), and pragmatic representation (i.e. the hierarchical structure of the speech acts that constitute the conversation).

To analyze pathological conversations, we propose the systematic construction of two simultaneous conversational representations, one for each interlocutor. On the schizophrenic's side, according to the principle of charity, there are no semantic contradictions. If there are failures, they occur at the pragmatic level, via violation of SDRT tree construction rules. The situation is not the same on the other side. In the conversations studied, the ordinary speaker is a psychologist asked to continue the interview. She does so in such a way as to repair the conversational structure after a break that would normally cause the interruption of a conversation. We then assume a corresponding postulate according to which the construction of a representation must respect pragmatic constraints. This option causes the appearance of inconsistencies at the semantic level.

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[8] That is to say neither more nor less than for non-schizophrenics. A general discussion on the status of logic is obviously not our purpose in this paper.

The duality of conversational representations reflects the duality of views on the conversation: the schizophrenic subject seems to contradict ordinary subjects, so the conversation works, but the representation of the co-constructed world is inconsistent (in third-person terms). Conversely, because the schizophrenic's conversational dysfunction is pragmatic in nature, her own representation of the world built through the conversation does not suffer from this defect (first-person point of view). The resulting situation is summarized in Table 1.

Ordinary interlocutor (Third-person point of view)	**Schizophrenic interlocutor** (First-person point of view)
Pragmatic correctness $\Downarrow$ Semantic deviance	Pragmatic deviance $\Uparrow$ Semantic correctness
Contradictory content: *apparent* contradiction!	Consistent content: *everything is OK!*

Table 1.1 The duality of views on a single conversation.

1.3 Theoretical Background

Before turning to empirical data and checking whether the interpretational strategy just presented can produce relevant analyses, we will present the theoretical background of our work, which relies both on psycholinguistics and on formal semantics.

1.3.1 Psycholinguistics

The goal of this research is to address the problem of thought disorders by drawing on the study of the mental illnesses that cause them. In psychology, the issue of abnormal thinking in a broad sense is usually discussed on the basis of three main approaches:

(i) a psychometric approach that emphasizes investigation by self- or interviewer-administrated questionnaires;
(ii) an experimental approach;
(iii) a pragmatic and psycholinguistic approach.

The first two methodologies provide, above all, pieces of information concerning the emotional sphere or the basic cognitive operations of the patient's mind, subject to dysfunction. The pragmatic approach enables psychologists to address the rationality of representational, meta-representational, and intentional capacities of the mind. Our research program falls into this third perspective and focuses, methodologically, on the analysis of verbal interaction. Among the various mental illnesses that are usually preferred in research on pathological cognitive processes, schizophrenia appears particularly suitable.

Indeed, according to the diagnostic criteria commonly used internationally (DSM-IV, [7]), schizophrenic patients are known first and foremost to suffer from thought disorders. This assumption is mainly based on the psychometric approach, which until now has been offering the most interpretative models of the term "thought disorder".[9] In addressing schizophrenics' speech in clinical interviews, pragmatic and linguistic-minded researchers are providing more and more precise descriptions of the specific features of disorders affecting language and language-use. But there is little objective – let alone pathognomonic – evidence of psychiatric disorders available from the scientific literature. Moreover, the pragmatic and dialogic indications uncovered in empirical data almost never lead to research on the semantic side. As a result, schizophrenics' thought processes, specific or defective, and potentially involving language, are still largely unknown.

Nevertheless, either in clinical practice or in research, all attempts to approach this illness, from the most academic to the most empirical, must in one way or another be subjected to an interactional, discursive framework, if only an experimental one. For fourty-some years now, research into psychiatric or cognitive disorders – just like the study of thought patterns – has inspired a large body of experimental and theoretical work in almost every branch of psychology, linguistics, and neuroscience, and in the cognitive sciences in general. It is clear, however, that only a small minority of these scientific publications have dared to approach thought processes in depth while simultaneously attempting to grasp any potential disorders likely to be expressed in context. Very few studies have approached the interface between these two domains by looking into how a given disorder and its associated thought patterns might be interrelated to the properties of the language, discourse, and conversation exhibited by the patient. This is despite the fact that increasingly accurate analytical tools, themselves derived from improvements in theoretical and methodological knowledge in several fields, are now available. Our pragmatic and conversational approach to abnormal cognitive psychology relies on the hypothesis that interlocution is a "natural" place for the expression of psychological and thought disorders. The interlocutory framework is equally applicable to clinical interviews, casual conversations, and even interactions set up experimentally. Consequently, the pragmatic approach to analyzing psychopathological conversations necessarily also describes the interpretive activity of each interlocutor, be that person "ordinary" or a patient. For example, this approach identifies the strategies an interlocutor implements in order to maintain a conversation based on certain processes or regularities that ensure turn-taking or make it possible to grasp the meaning of utterances and mental processes activated by communicating subjects.

In this epistemological and methodological context, this chapter will examine the conditions under which a basic technique for analyzing thought disorders can be developed, i.e. one that combines advances in the pragmatic conversational analysis of pathological interactions with progress in the formal analysis of verbal interaction. But for such an undertaking to be possible, even if only in the medium term, we need a pragmatic model of

[9] It may be questionable to use the categories from DSM while claiming to account for a first-person perspective on pathological reasoning through conversations. However, our purpose is not to define schizophrenia, but rather to offer a fine-grained conception of what is going on in conversations with schizophrenic people. Reference to the DSM classification provides us with the starting point for our research, not the final destination.

conversation capable of accounting for the dynamic properties of sequences containing a discontinuity [20]. In order to develop such an analytical method, it must be possible (through a semantic approach) to devise a formal method capable of incorporating the properties of conversational discontinuity in such a way as to optimally describe and interpret it, and thus uncover and analyze the rationality of the underlying psychological (or cognitive) processes.

1.3.2 Formal Framework

The formal framework used in this paper is that of Segmented Discourse Representation Theory (SDRT), presented by Asher and Lascarides in their *Logics of conversation* [2]. SDRT combines two levels of analysis in order to account for the interpretive process at work in conversations: semantic content and conversational pragmatics. The first is analyzed via Segmented Discourse Representation Structures (SDRS) inspired by the DRS of Discourse Representation Theory (DRT), which is a syntactic construction updated by conversational flow [17]. Conversation also implies pragmatic relations between speech acts, the complexity of which gives rise to a hierarchical structure first described in linguistics in the 1980s [31]. We propose formalizing this relationship with the rhetorical relations in SDRT. A conversation is then interpreted via a double construction: that of a hierarchical tree linking actions, and that of the DRS representing the semantic content of segments. The assumption we make is that schizophrenic persons do not always conform to the rules that prevail in this double construction, which explains the phenomenon of conversational failure perceived by “ordinary” speakers.

The rhetorical structures of SDRT link the actions of speakers and are represented as hierarchical trees with vertical, horizontal and diagonal relations depending on the type under consideration. The tree structure (hierarchical ordering) encodes properties of the discourse and can be used to resolve semantic effects (e.g. prediction of attachment sites or resolution of anaphora). A discourse relation is viewed as a binary relation between propositions. A narration is thus typically a horizontal relationship (same hierarchical level), as well as the answer to a question, while an elaboration is a vertical relationship (subordinated to what it elaborates on) and a question an oblique relationship (vertical, and thus subordinated, but also horizontal because requiring an answer).

An example of SDRT structure, taken from [18] and slightly modified, is shown in Figure 1.1. The tree is updated throughout the discourse. Each subsequent intervention by one of the interlocutors is supposed to be related to the conversational representation already built. The structure then allows us to identify general constraints affecting the attachment sites. The main constraint is the so-called right-frontier constraint, forcing the connection to the nodes located on the right side of the tree. Based on this example, the assertion “He found it really wonderful” is ambiguous, since the pronoun (“it”) can take multiple values. As indicated by the right-frontier constraint, this sentence cannot be linked to “He ate salmon”, and therefore “it” cannot refer to the salmon, but it can be

related to any other node of the tree, and thus "it" may refer to the cheese, the meal, or the evening.[10]

Here, we will focus only on the SDRT tree, but we assume that propositions are DRSs. However, we also introduce themes, which should be supported by the DRSs. Themes are coherent sets of DRSs, and we mark them with boxes. We assume that a DRS cannot simultaneously belong to two different themes, unless one is included in the other, in which case these boxes represent a hierarchy: inclusion between boxes is allowed, but overlapping is not.

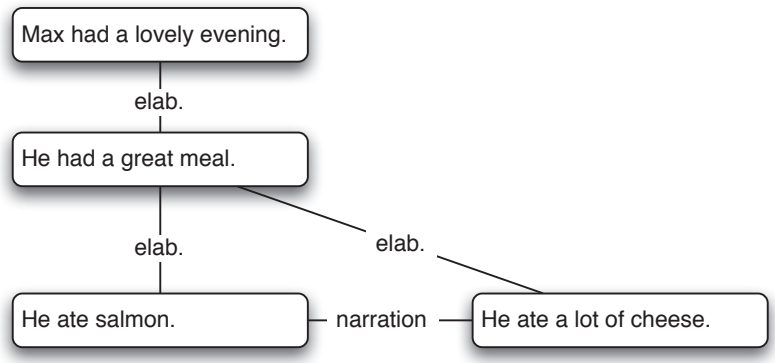

Fig. 1.1 A simple representation of the structure of a discourse

1.4 Analyzing empirical data

As Perkins claims [25, 295], we can all think of people who are "poor communicators" in spite of good linguistic ability. But in cases where a communication deficit is directly linked to an illness diagnosable according to independent clinical criteria, we have a clearer starting point. Detailed indications about the participants in the corpus are available from Musiol and Verhaegen's chapter [24], section ***. Here we present the way relevant excerpts are selected, in subsection 1.4.1. The last step is devoted to formalization, which is briefly presented in subsection 1.4.2.

1.4.1 Selection of relevant excerpts

The study was based on a pragmatic and dialogic analysis of verbal transactions taken from a corpus of 30 interviews. In all cases, the interviewer was a research psychol-

[10] SDRT also introduces variables representing the conjunction of elaborations. The right-frontier constraint thus provides access to the statement containing salmon, though not to the salmon itself.

ogist and the interviewee was either a schizophrenic patient or an individual with no psychiatric disorders. All interviewees agreed to have the conversation recorded so that we could compile our corpus. They were told why they were being recorded, and we did not conceal the fact that they were participating in a study. The instructions were simply to talk to the interviewer. If the interviewee initially said he/she was having trouble expressing him/herself, the interviewer started with a relatively general topic of conversation (everyday activities and/or concerns). The corpus was transcribed by two researchers, one of whom was not involved in this study. Transcriptions were compared, differences discussed (with other colleagues when necessary), and a final transcription chosen. The (↑) and (↓) arrows respectively indicate a rising or falling intonation. The (→) arrow indicates a pause in the flow of speech for 2 to 5 seconds.

The breakdown of the entire interview corpus yielded 403 conversational sequences (or transactions). These transactions are built on the basis of sequences of elementary acts, also called speech acts or discourse acts. Empirically speaking, our research in this area over the past fifteen or so years [23] has enabled us to hypothesize that conversations involving a schizophrenic patient exhibit many incongruities and discontinuities. Our studies have also led us to the hypothesis that the discontinuities formally detected and delineated within a verbal interaction with a schizophrenic fall into two main categories, defined by the so-called hierarchical and functional properties of the discourse structure. In this "hierarchical and functional" structure of discourse [31], we will call the first category "non-decisive" and the second "decisive". In our model's current state of development, there are two types of decisive discontinuity.

We call the first type "conversational gear shifting" [35, 22]. Discontinuities of this type disrupt the turn-taking process while sequentially satisfying the chaining constraints of two leading interventions. They are characterized by a surreptitious change in the speaker's course of action (here, the schizophrenic patient), despite the fact that he/she was the initiator. The referential context thus changes without any indication of that change from the speaker.

Our model involves a second type of decisive discontinuity, qualified as a "defective conversational initiative" [20]. Granted, this type of within-intervention discontinuity consists in chainings that sequentially satisfy the interactional constraints governing the organization of the exchange-level subcomponents of the complex transaction unit; yet it consists specifically of discontinuities that are inherent to the hierarchical and functional relations governing the sequencing of speech acts at different levels (in the sense that an act can impose interactive constraints on the constituent that follows or even precedes it, while still being dependent upon it hierarchically and functionally). In this case, the schizophrenic patient has initiated the conversational transaction and supports the argumentation of the "ordinary" interlocutor. Nine sequences were compatible with our decisive discontinuity model. All nine sequences occurred in the paranoid schizophrenic subcorpus. This subgroup differed significantly from both the disorganized schizophrenic group (binomial test $p = .002$) and the "ordinary" group (binomial test $p = .002$). Among these nine paranoid schizophrenics, three were from the no-medication group (SCH-P-N) and six were from the antipsychotic medication group (SCH-P-A). Our decisive discontinuity model thus allows us to propose some possible explanations for the dysfunctional interpretive and inferential thought processes of schizophrenics of the paranoid type, with help from an additional analysis based on formal semantics.

1.4.2 Formalization

In order to formalize pathological conversations, we make a double conjecture:

1. Schizophrenics are logically consistent; therefore, conversational breaks occur in the construction process of the pragmatic structure of conversations (i.e., on the rhetorical relationships between SDRS); and
2. Under-specification (ambiguity) plays a central role in these failures, which could be summarized by the phrase: a choice is never definitive!

The first conjecture is nothing but the implementation of the principle of charity. The second conjecture, which is primarily based on empirical observation, is a heuristic for the location of remedial strategies in action by the "ordinary" speaker. When there is the appearance of discontinuity, the speaker uses the underspecified relations in order to maintain the pragmatic consistency of the dialogue. In other words, the flexibility of underspecified relations enables one to build a conversational representation under any circumstance.

We had to extend the basic set of rhetorical relations in SDRT to account for the complexity of the dialogic interaction, especially taking into account the meta-conversational adjustments absent from the original theory. Studying of the corpus led us to identify the types of relationships summarized in Table 1.4.2.

The formalization of conversations is reduced to the elements relevant to our analysis, which means that we abandon anything that does not seem to play a role in explaining the breaks. The representation of semantic content is thus stripped to a minimum, namely to the conversational topic. Each conversational sequence is indeed built around a theme, which is the main contextual element relevant to disambiguating the underspecified terms.[11]

The conversational theme usually changes after a conventional signal (e.g., "Well, but..." or "Moreover..."), or another form of closure of the current conversational sequence. Maintaining the ongoing theme enables the continuation of a tree, while a theme shift implies a rise through the tree to relate to a dominant node which corresponds to a sequence preceding the exchange. Our formalization introduces *thematic sets* (represented by either boxes or colors), which are consistent sets of units of speech that can be mutually inclusive (without duplication),[12] and the rule of climbing in a SDRT tree, which is allowed only if the current thematic box is properly closed.

To analyze pathological conversations, we always offer the simultaneous construction of two representations, one for each speaker. For the schizophrenic, the postulate of logicality means that the representation is devoid of contradictions at the semantic level. If there are breakdowns, they operate at the pragmatic level, with a departure from the rules for constructing the SDRT tree. The situation is different on the other side. In the conversations that constitute the corpus studied, the "ordinary" interlocutor is a psychologist in charge of continuing the interview. He or she does so in such a way as to "fix" the con-

[11] The fact that many ruptures take place around underspecified expressions reinforces our choice to represent the thematic element in the formalization.

[12] Since it pertains to semantics, the thematic criterion could in principle be represented by a marker inside the SDRS. As it is the only semantic element expected to appear in our simplified representations, we have chosen to waive SDRS, leaving only the pragmatic tree and a mere pictorial thematic marker.

Horizontal relations	Vertical relations	Diagonal relations
Narration	Elaboration	Question
Answer	Elaboration: explanation	Question: driving
Phatic answer	Elaboration: instruction	Meta-question
Continuation	Evaluation	Elaboration requirement
and illustration	Phatic	Driving
	Counter-elaboration	
	Justification	

Table 1.2 Pragmatic relation types

versational structure after a break, even if this break would have caused the interruption of a conversation in another situation.

We then admit a postulate corresponding to this requirement, namely the construction of a pragmatic representation within the constraints. This option causes the appearance of inconsistencies on the semantic side. As we argued above, dual conversational representations reflect a duality of views on the conversation. According to the "ordinary" subject, the schizophrenic apparently contradicts the dialogical behavior so that the conversation works, but the representation of the co-constructed world is inconsistent. Conversely, when we assume dysfunction in a schizophrenic's management of pragmatic relations, the representation of the world built by the conversation does not suffer from this defect.

We assume that exchanges are excerpts from larger exchanges, whose starting point is a particular semantically empty node . Thus, whatever the treatment, this root node can be used to link to a new proposition in the pragmatic representation. Analysis of excerpts leads us to highlight two transgressions of the standard SDRT rules: breaks of the right frontier and rises through the structure without any acceptable closing (inconsistency of representation). For the second phenomenon, it is indeed common in corpora to identify items that are used both to close a part of the exchange and to open a new one. But the schizophrenic sometimes does not respect this dual effect and creates an incomplete representation that is not interpretable in a usual way.

1.5 Two Examples

We will focus on two non-canonical uses of SDRT: break of the right frontier and rise through the structure without completeness. Throughout the corpus, we identified three ruptures of the right frontier and five rises without completeness. We will go back over two examples from the corpus, each of which highlights one of these phenomena.

1.5.1 Break of the Right Frontier

The first excerpt is shown in Figure 1.2. In this exchange between a psychologist (K) and a schizophrenic patient (J), there is ambiguity about the meaning of "here". It can mean either (a) *in the hospital*, or (b) *in the room*. In principle, there could be many other

meanings, but the conversational context restricts the set of possible interpretations to (a) and (b). Any residual ambiguity should be resolved by context updating through the conversational exchange. In this exchange, while it is acknowledged that the conversation has moved from the (a)-meaning to the (b)-meaning of "here", the schizophrenic shifts back to (a) with no warning [36]. As we will see, this shift is made irrespective of the right frontier constraint.

Figures 1.3 and 1.4 provide two SDRT-like representations of the excerpt, the former according to the ordinary speaker, the latter according to her shizophrenic interlocutor. The two representations are similar until K_{14}. They then diverge radically, as will be explained.

The starting point of the exchange is K_1, which is linked to the initial node (an abstract root node of the tree). It consists of a question (*quest*, oblique relation) from the psychologist, in which a first token of "here" occurs with obvious ambiguity. The schizophrenic answers (*ans*, horizontal relation) in J_1, interpreting "here" as *in the hospital* (a). The answer splits into two parts. The second part is an elaboration (*elab*, vertical relation) on the beginning.

But, this was not the the psychologist's intended meaning. In K_2^1, she closes the starting exchange, asserting "Yes", which is a phatic (*phat*, here horizontal), then asks her question (*quest*) again in K_2^2. Since this question does not relate to any previous box, it is linked to the root node. Now it is clear for both interlocutors that "here" means *in the room* (b). In the SDRSs, we represent the thematic variability with colors. The boxes corresponding to acts interpreted relative to (a) are grey, whereas those corresponding to (b) are white. The agreement between the interlocutors is corroborated by the patient's answer (*ans*) J_2, which clearly refers to the (b)-meaning.

In K_3, the psychologist asks a meta-question (*meta-quest*, oblique), i.e. not a question directly about the main topic, but a metaconversational question about what was stated by her interlocutor (here, about the name "Tania"). In J_3^1, the schizophrenic answers this question and closes the subdialogue. He then continues his narration (*narr*, horizontal) with J_3^2, which is attached to J_2. K_4 is a phatic (*phat*, here vertical), or maybe a driving. However, the schizophrenic does not take K_4 into account and goes on with his narration in J_4. K_5 is a confirmation question by the psychologist, and J_5 its immediate answer ("Mm-hmm" meaning here *Yes*).

In K_6, the psychologist requests elaboration (*elab-request*, oblique) on the narration (her act is not attached to the answer just given by the patient, but to J_4.) The schizophrenic starts answering in J_6^1, then (critically) evaluates (*eval*, vertical) the whole situation in J_6^2. The psychologist disputes this evaluation, starting a counter-elaboration (*counter-elab*, vertical) with K_7. Since the patient falsely understands "last year" instead of "last Monday", he opens a subdialogue with a meta-question in J_7, which he closes with a phatic in J_8. In K_9, the psychologist carries on with her (counter-)elaboration.

The segment between J_9 and K_{11} has a complex attachment to what precedes it. It starts like a question, but this is actually the question that the psychologist would have asked if her interlocutor had let her finish her sentence. The question is therefore mixed with a driving (*driving*, also oblique), i.e. with an utterance designed to help the interlocutor to continue. After a short metaconversational exchange about J_9, between K_{10} and K_{11}, the schizophrenic finally answers the question with J_{11}. The psychologist then uses a phatic in K_{12}, which could close the subtree.

(K_1) Pourquoi vous êtes ici (↑)
(J_1) [D'accord (*ton concédant*)(→) parce que je sais pas (*accentué*) quoi faire tout seul (→)]^1 [et il faut tout le temps un qui m'aide (→)]^2
(K_2) [Oui (→)]^1 [et ici alors (↑)]^2
(J_2) Mmm (*respire fort*) (→) je sais pas moi pour-quoi (*détaché*) (→) oh je sais pas (→) la la la Tania elle m'a dit (→) (*soupir*)
(K_3) Tania (↑)
(J_3) [Oui la la (→) l'infirmière Madame Tania (→)]^1 [elle m'a dit comme ça (→) allez voir ici (→) y'a pt'être quelque chose qui vous (→)]^2
(K_4) Y'a quelque chose (↑)
(J_4) Qui vous intéresse
(K_5) Ah (→) elle vous a dit ça (↑)
(J_5) Mmm
(K_6) Et alors (↑)
(J_6) [(→) Mm cinq minutes (*marmonne*) (→)]^1
[je sais pas à quoi ça sert]^2
(K_7) Enfin je vous avais vu lundi dernier pour vous expliquer un peu (→) lundi dernier (→) j'étais venue au pavillon pour vous demander s'il était possible de vous voir aujourd'hui
(J_7) L'année dernière (↑)
(K_8) Lundi dernier
(J_8) Ah lundi (*accentué*) dernier OK
(K_9) Donc heu aujourd'hui quand heu (→) Tania vous a dit de venir ici (→) vous ne vous souveniez plus de (→)
(J_9) Mmmmm (*chantonne*) de quoi il s'agissait (↑)
(K_{10}) Comment (↑)
(J_{10}) De quoi il s'agissait
(K_{11}) Oui
(J_{11}) Ah je m'en rappelle plus bien
(K_{12}) Ah bon
(J_{12}) Vous fumez (↑)
(K_{13}) Je ne fume pas (→) non
(J_{13}) [Oh c'est dommage (→)]^1 [ça fait déjà quatre fois]^2
(K_{14}) Ça fait déjà quatre fois (↑)
(J_{14}) [Ah je sais je sais je sais (→) moi qu'est-ce qui m'intéresse (→)]^1 [pourquoi je suis venu ici (→) ou bien pourquoi que (→) pourquoi que (→) pourquoi que (→) on m'a envoyé ici (→) parce que (*respire fort*) (→) bon]^2
(K_{15}) On vous a envoyé ici (↑)
(J_{15}) Comment (↑)
(K_{16}) On vous a envoyé ici (↑)
(J_{16}) [Oui (→)]^1 [depuis le premier jour que je suis arrivé (→) de l'année dernière le deux février]^2

(K_1) Why are you here (↑)
(J_1) [Okay (*conceding*)(→) because I dunno (*emphasis*) what to do on my own (→)]^1 [somebody always has to help me (→)]^2
(K_2) [Yes (→)]^1 [and so here (↑)]^2
(J_2) Hmm (*breathing hard*) (→) I dunno why (*detached*) (→) oh I dunno (→) the the the Tania told me (→) (*sighing*)
(K_3) Tania (↑)
(J_3) [Yes the the (→) nurse Mrs Tania (→)]^1 [she told me just (→) go see here (→) maybe there's something that might (→)]^2
(K_4) There's something (↑)
(J_4) That might be interesting for you
(K_5) Ah (→) she told you that (↑)
(J_5) Mm-hmm
(K_6) And so (↑)
(J_6) [(→) Hmm five minutes (*mumbling*) (→)]^1
[I dunno what the point is]^2
(K_7) Well I saw you last Monday to explain a bit (→) last Monday (→) I came to the pavilion to ask you if we could meet today

(J_7) Last year (↑)
(K_8) Last Monday
(J_8) Oh last Monday (*emphasis*) okay
(K_9) So uh today when uh (→) Tania told you to come here (→) you couldn't remember (→)

(J_9) Hmm-mm (*humming*) what it was about (↑)
(K_{10}) Sorry (↑)
(J_{10}) What it was about
(K_{11}) Yes
(J_{11}) Oh I can't really remember
(K_{12}) Ah okay
(J_{12}) Do you smoke (↑)
(K_{13}) I don't smoke (→) no
(J_{13}) [Oh that's too bad (→)]^1 [that makes four times now]^2
(K_{14}) That makes four times (↑)
(J_{14}) [Oh I know I know I know (→) what's interesting for me (→)]^1 [why I came here (→) or why it is (→) why it is (→) why it is (→) they sent me here (→) because (*breathing hard*) (→) yeah]^2

(K_{15}) You were sent here (↑)
(J_{15}) Sorry (↑)
(K_{16}) You were sent here (↑)
(J_{16}) [Yes (→)]^1 [since the first day I got here (→) last year February second]^2

Fig. 1.2 Extract from a pathological conversation "*Here*, where?"

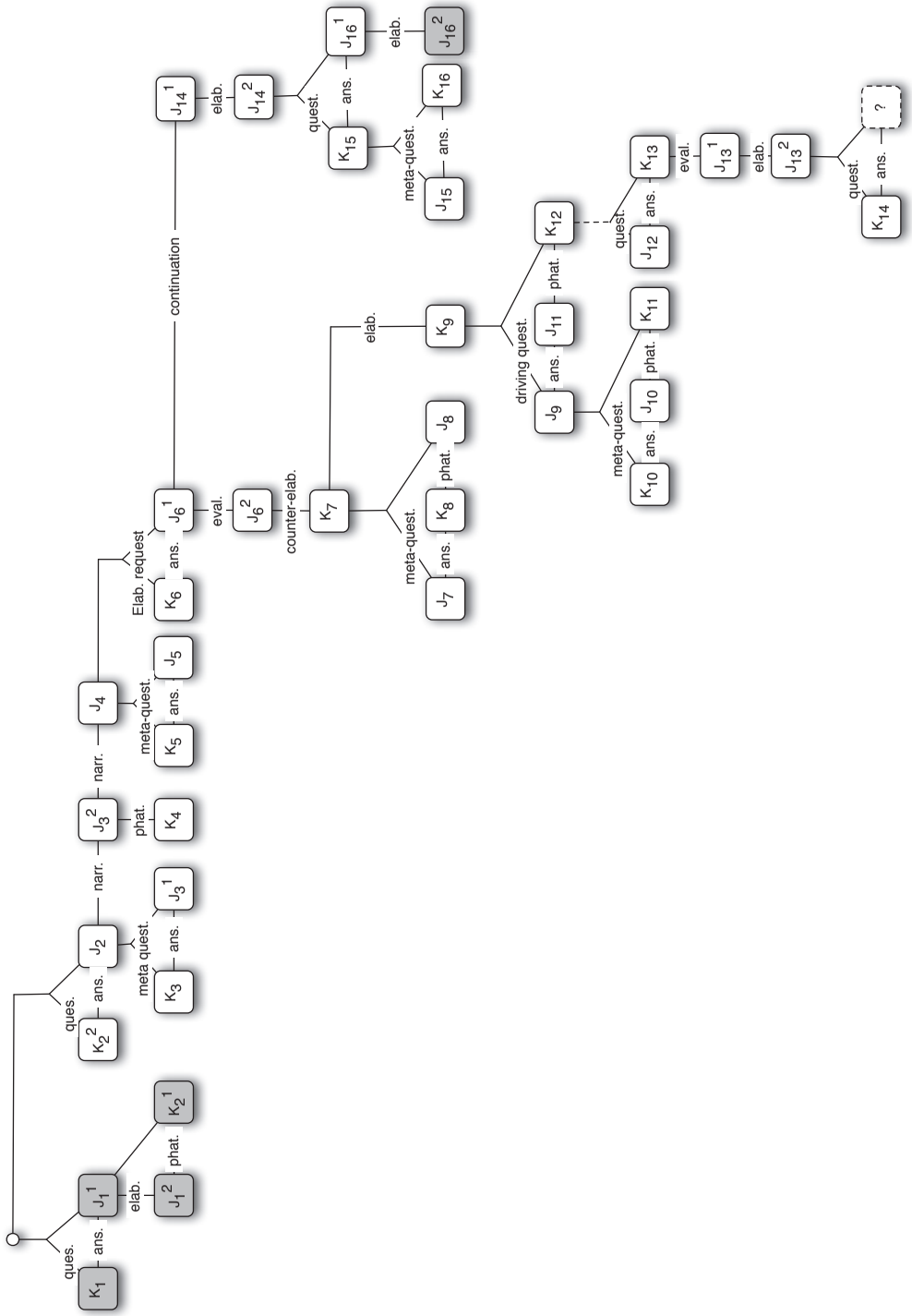

Fig. 1.3 Representation by the ordinary speaker (K)

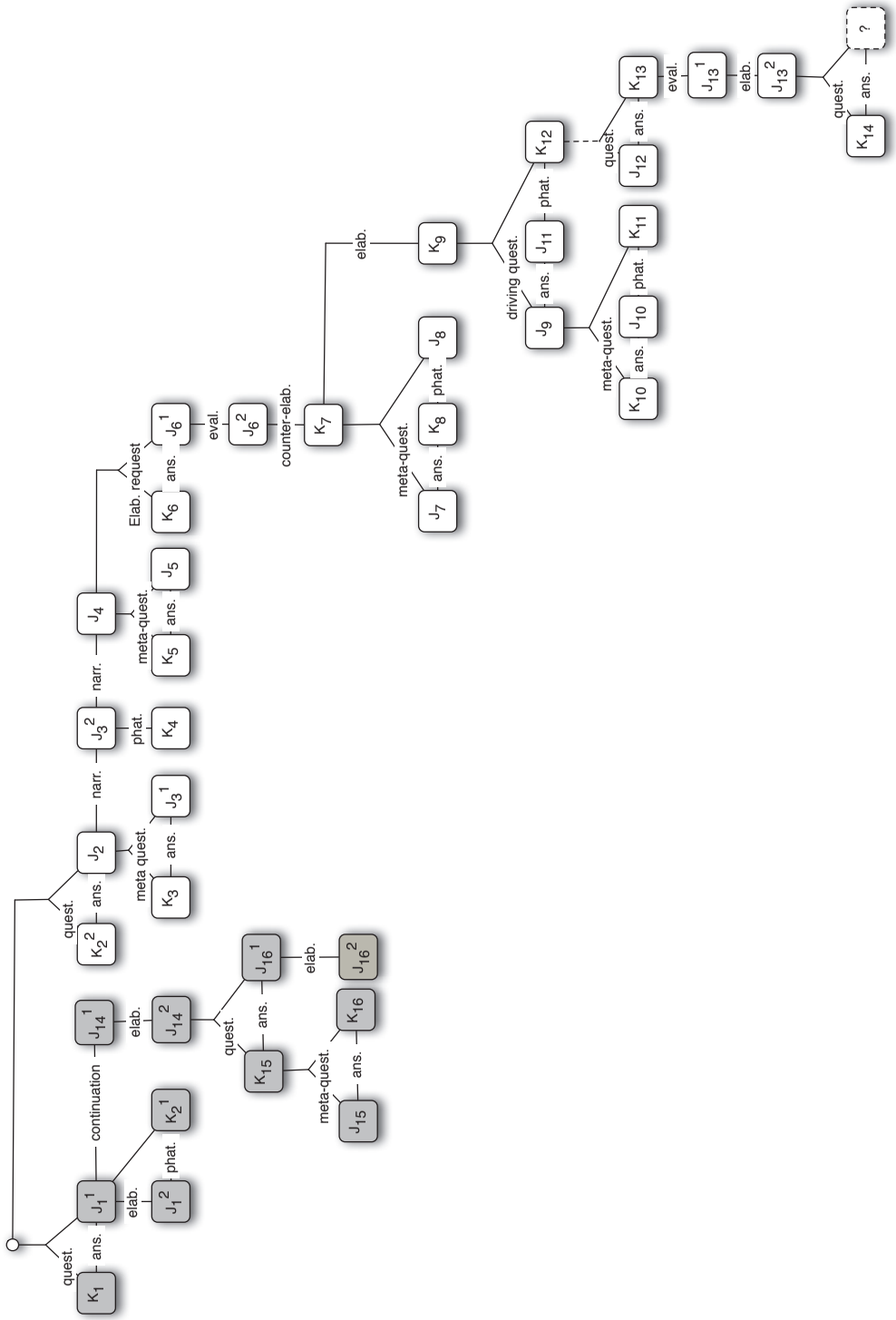

Fig. 1.4 Representation by the schizophrenic speaker (J)

The schizophrenic opens a subdialogue about *smoking*, i.e. about features of the extra-conversational context. The subtree J_{12}–K_{14} corresponds to this subdialogue, and is conventionally attached to the closest preceding box, K_{12}, even though it is not related to the semantic content of K_{12}.[13] Just like its start, the subdialogue's ending is not correct because there is no answer to the question asked by the psychologist in K_{14}. Hence the subtree is not closed. This might be justified by the fact that the schizophrenic interlocutor then resumes the main conversation.

We have now reached the point where the interlocutors start diverging. Let us first look at the psychologist's point of view (Figure 1.3). In J^1_{14}, when the schizophrenic asserts he knows what is interesting for him, this appears to be a delayed answer to the elaboration request K_6. The utterance is thus attached to J^1_6, the beginning of the answer, as a continuation (*continuation*, horizontal). Let us keep in mind that this elaboration request happened after an answer to the initial question asked by the psychologist, "why are you here?". This is therefore what the interlocutor is expected to carry on answering. In J^2_{14}, the patient elaborates on his answer and says for the first time that he was sent here. The psychologist asks him for an explanation, or at least a confirmation, with K_{15}. After a two-round metaconversational adjustment (J_{15}–K_{16}), the schizophrenic answers the question in J^1_{16}, then elaborates on his answer in J^2_{16}. But the semantic content of J^2_{16} is clearly inappropriate in the current conversational context. The schizophrenic has shifted back to the first interpretation of "here", indicating a blatant inconsistency.

Let us now look at the schizophrenic's perspective (Figure 1.4). We will assume semantic consistency, i.e., in our representation, thematic coherence. As evidenced by the psychologist's point of view, with J^1_{14}, the schizophrenic starts answering a question that was asked earlier. It seems as though the speaker is lost and does not know where to attach his utterance. What is most plausible in order to preserve the speaker's consistency is that J^1_{14} is attached to J^1_1 as a continuation. From a semantic/thematic viewpoint, J^1_{14} fits perfectly with the (a)-interpretation of "here" as *in the hospital*, which is relevant to J^1_1. However, while making this attachment, the speaker breaks the right frontier constraint.

Both views are questionable for any ordinary speaker, who would accept neither semantic inconsistencies, nor pragmatic fallacies. Nevertheless, we can conjecture that the conversational situation is acceptable for the schizophrenic since he is the speaker whose utterances generate the apparent breaks. This entails that pragmatic rules like the right frontier constraint are relaxed for him, whereas logical norms still apply.

1.5.2 Rise Through the Structure with Inconsistency

The second pathological use of exchange conventions is more complex to express in a non-logical framework.[14] When an interlocutor shifts topics, she is conventionally expected to make this obvious via by some linguistic marker. This is generally required for the dialogue to go on. Schizophrenic interlocutors, however, sometimes change the

[13] This conventional attachment grants that the closest preceding node will remain available for further attachment. Another possibility would be to leave the subtree with no attachment, since it corresponds to a subdialogue with no connection to the current conversation.

[14] The example analysed in this subsection was already given in [1].

subject and continue their narration without respecting this convention. In our context, the prototypical case corresponds to the psychologist's expectation of an answer on a specific theme (or a question), which the schizophrenic never gives. The lack of a target for such switches produces an inconsistency in the structure. Breaks of the right frontier, though they constitute violations of a hard constraint, do not stop the building of a tree structure for the rhetorical representation. The issue raised here is the lack of information for a complete representation. For instance, bindings are introduced in an ad hoc way that relates the current segment to some abstract point that does not make sense. Assuming such bindings ensures that an acceptable structure is available for the exchange to continue.

An illustration of this case is presented in the second excerpt, in Figure 1.5. In this short dialogue, the psychologist performs a rise through the structure (but with consistency). Next, the schizophrenic rises with inconsistency. The schizophrenic plays on the ambiguity of the loss (feel lost vs. lose someone or something). The main part of the exchange goes normally. But now, the schizophrenic is driving the dialogue. The psychologist loses control and at some point his understanding of the conversation. The first sign of this is the question from the schizophrenic, G^2_{86}, which seems too abstract for this dialogue. Then, the psychologist closes the subpart of the tree and starts a new theme attached to G^3_{82}. The psychologist's challenge is to deal with how the schizophrenic feels. By doing this, he closes the question and waits for the rest. In the formal representation, the V_{87} node (the darkest one in Figure 1.5) is duplicated, and a dotted line links the two V_{87} nodes.

After this admissible rise, the schizophrenic accepts the climb, but instead of responding in G_{88} with an answer (or an elaboration), he or she rises again through the structure to a higher node. This could be either a previous node, possibly not defined in this excerpt, where they discussed the loss of someone, or at least the root node. In any case, he or she can rise if and only if the subparts are correctly closed (just by answering the question). He or she does not do so here, and that is why it is not possible to duplicate G_{88} in Figure 1.5 so as to properly answer V_{87}. The psychologist continues the dialogue without knowing from where in the tree.

Even if it is difficult to define the target of the duplication in sentences (a word, a relation, etc.), it is perfectly admissible for the psychologist to follow the standard rhetorical rules and for the schizophrenic not to. From here, we could argue that the problem comes from the psychologist who started the rise. But the key point in this example shows that the issue is not the rise, but the consistency.

This phenomenon is the most frequent discontinuity in the corpus. An important remark on this structural (and not strictly logical) inconsistency is that in all exchanges, schizophrenics always use ambiguity as support. It may be lexical (as in the present example about loss), semantic (the switch of an entity of the universe of discourse based on the name of the entity), or caused by any underspecified relation. Formalization requires resolving this ambiguity before continuing, and when a choice is made, it is assumed in what follows. But the schizophrenic still considers this relation unbounded, such that he or she may go back on the chosen interpretation.

(G_{82}) (...) [l'an dernier euh (→) j'savais pas comment faire j'étais perdue]^1 [et pourtant j'avais pris mes médicaments]^2 [j'suis dans un état]^3 [vous voyez même ma bouche elle est sèche j'suis dans un triste état]^4
(V_{83}) Vous êtes quand même bien (↑)
(G_{84}) [J'pense que ma tête est bien mais on croirait à moitié]^1 (↓) [la moitié qui va et la moitié qui va pas j'ai l'impression de ça vous voyez]^2 (↑)
(V_{85}) D'accord
(G_{86}) [Ou alors c'est la conscience peut être la conscience]^1 [est-ce que c'est ça]^2 (↑)
(V_{87}) Vous savez ça arrive à tout le monde d'avoir des moments biens et des moments où on est perdu
(G_{88}) Oui j'ai peur de perdre tout le monde
(V_{89}) Mais ils vont plutôt bien vos enfants (↑)
(G_{90}) [Ils ont l'air ils ont l'air mais ils ont des allergies ils ont]^1 (→) [mon petit fils il s'est cassé le bras à l'école tout ça]^2

(G_{82}) (...) [Last year uh (→) I didn't know what to do I was lost]^1 [even though I was taking my medication]^2 [the shape I'm in]^3 [see even my mouth is dry I'm in bad shape]^4
(V_{83}) But you're all right (↑)
(G_{84}) [I think my head's all right but it's like it's half]^1 (↓) [half all right and half not all right that's how I feel you know]^2 (↑)
(V_{85}) Okay
(G_{86}) [Or it's my awareness maybe my awareness]^1, [is that it]^2 (↑)
(V_{87}) You know everyone has times when they feel all right and times when they feel lost
(G_{88}) Yes I'm afraid I'll lose everyone
(V_{89}) But your children are doing pretty well (↑)
(G_{90}) [They seem to be they seem to be but they have allergies they have]^1 (→) [my grandson broke his arm at school and everything]^2

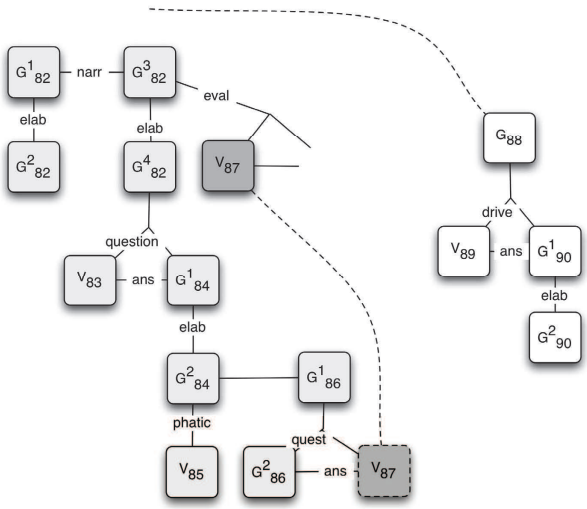

Fig. 1.5 Rise over the sub-structure

1.6 Concluding remarks

We argue that rationality, while not reducible to logicality, contributes to the dynamics of clinical interviews. Moreoever, since schizophrenia appears to be more pragmatic than semantic in nature, our investigations focussed not only on the relations between two interlocutors' speech acts, but also on the relationships that link each communicating subject to the dialogical context, and especially to his or her interlocutor. In cognitive terms, our analyses have to take into account the two speakers' thought management strategies, as well as the thought contents themselves.

Pragmatic relations that contribute to the balance of trade in schizophrenic pathological exchanges are indeed also an expression of cognitive processes, namely intentional ones, since the protagonists of the exchange are in a position to "interpret" one another. The principle of rationality, e.g. as defined in [26], states that human beings act according to reason, i.e., based on considerations that have some normative force and are binding, and that justify their actions. This principle can be translated into intentional terms from a dialogical perspective. Each of the two interactive subjects sets up adaptive procedures in order to handle the needs and peculiarities of his or her interlocutor. In cognitive psychology and philosophy of mind, this view has become widespread through the assumption that agents act by virtue of intentional states and representations with contents that are the causes of their actions [15]. For these two disciplines, and especially for evolutionary psychology, the principle of rationality is at the heart of the "interpreter's strategy", a.k.a. "intentional stance" [12]. Common sense or folk psychology, in other words the psychological background on which one spontaneously settles one's relationships with others, involves rational calculation that can be expressed in terms of desires, expectations and beliefs.

This ability to manage both the dialogue and one's interlocutor in a situation of interaction is assumed to be partly the result of evolution [21]. Since some schizophrenic disorders are likely to be accounted for by explanations of an evolutionary nature, at least as far as language [10], reasoning [8, 9], and social behavior [5] are concerned, we can expect that the study of such pathological interactions will tell us something about the rationality of the cognitive processes listed above. Indeed, the manifestation of the disorder during interactions and the need to maintain the link cause the schizophrenic interlocutor to adopt a compensatory management strategy. This strategy is presumably based on archaic cognitive processes, which are actually harder to detect in ordinary conversations than in this type of clinical interview.

Thought disorders are one of the best areas for investigating for the pragmatic and semantic perspectives on the incoherence of speech. Thanks to our methodology and focus on the intentionality of the mind and of thought, our approach complements many papers in neuroscience and cognitive science on the same subjects. This approach is also probably relevant to the investigation of psychiatric disorders and the diagnostic criteria associated with them, as well as to the question of the existence of pathognomonic signs in mental illness, and to the more general question of the relationships between discourse and cognition.

We hope to have shown that mental illness in general and schizophrenia in particular raise issues of great interest not only to psychopathology and psychiatry, but also to linguistics and epistemology. This research needs to be expanded to bigger corpuses. By

looking at natural language in its interactive dimension, our work opens new perspectives on the study of schizophrenic behavioral deviancies in psychology. Linguistically speaking, empirical data from pathological conversations offer a new challenge. Theoretical models must account for such data in a non-standard way because they are deviant. The main epistemological difficulty lies in the complex picture that emerges from such studies, for there are no longer two, but three terms to include in a notion of reflexive equilibrium: linguistic norms (accounted for by linguistic theory), normal performance, and deviant performance. The evaluation of the impact of this new kind of data is left to future work.

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