Looking for logic in all the wrong places: An investigation of language, literacy and logic in reasoning
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Citation for published version (APA):
Counihan, M. E. (2008). Looking for logic in all the wrong places: An investigation of language, literacy and logic in reasoning Amsterdam: ILLC
Chapter 1

Logic, language and Khamrak

E: In the Far North, where there is snow, all bears are white. Novaya Zemlya is in
the Far North and there is always snow there. What color are the bears there?
S: I don’t know what color the bears are there, I never saw them.

E: But what do you think?
S: Once I saw a bear in a museum, that’s all.
E: But on the basis of what I said, what color do you think the bears are there?
S: Either one-colored or two-colored ... [ponders for a long time]. To judge from
the place, they should be white. You say that there is a lot of snow there, but
we have never been there!

Subject: Khamrak., age forty, miller from remote village, illiterate.
(Luria, 1976, p. 111).

This is the transcript of an exchange which took place far away and long ago:
in rural Soviet Russia in the 1930s, between the Russian psychologist Alexan-
der Luria and his experimental subject, Khamrak. On reading it, one might
well think that it comes from too far away and too long ago to any longer be
of academic interest. One might write it off as an experimental anachronism,
with entertainment value but not worth further serious study. That would be a
mistake, as I hope to persuade you in this chapter. Such exchanges are highly
relevant for contemporary theories of reasoning and, at the same time, yet to be
fully understood.

The first notion we should disabuse ourselves of is that the above exchange
was a one-off. In fact, the subject Khamrak’s response is in key respects strikingly
similar to other responses, not only those gathered by Luria, but also in more
recent similar studies in Liberia (Scribner, 1997, Cole, Gay, Glick & Sharp, 1971),
elsewhere in Soviet Russia (Tulviste, 1991), North America (Hamill, 1990), Zam-
bia (Willemsen, 2001) the Netherlands (Kurvers, 2002) and, as reported here,
South Africa. It is thus no experimental oddity. Rather it reveals something
general about an unschooled response to logical reasoning tasks. Now the sceptical reader might grant that it reveals something general about performance on these tasks but not something general about human reasoning, since the task is an induced reasoning situation and it is not clear how performance in such an ‘artificial’ situation relates to general reasoning behaviour. Again that would be wrong. I will argue that, although work in this area has, as yet, failed to connect adequately performance in logical tasks to general reasoning and linguistic behaviour, the connection is there. A more precise description of what it might be is precisely what this chapter seeks to contribute. I hope to show that for the most part illiterate responses on logical tasks are on a continuum with those given by schooled subjects; and that for both groups we can learn much about general reasoning behaviour on the basis of their performance, if we only consider the meaning constructing processes which generate the transcripts, so to speak. Both the continuities and the discontinuities with schooled subjects are highly instructive for theorising about reasoning.

This connects up with another dimension of the study of reasoning which makes unschooled reasoning, as illustrated above, pertinent. This dimension is the representativeness of the existing experimental sample. Almost all empirical work in the psychology of reasoning has been conducted with a subject population of university undergraduate students. In terms of interaction with the presented material we might well wonder how representative this group is of the rest of the human population. Which parts of what they do are an artifact of their specific, and perhaps specifically literate, approach to the problem? Which aspects are driven by truly universal human cognitive traits? Mostly, we can’t yet tell. As such, the validity of their response profile on any one task for a general theory of reasoning is unclear. Moreover, there is a more subtle confound in work with undergraduate subjects. Reasoning researchers themselves come from this same sub-population, at the high end of the literate scale, and thus there might be many shared assumptions about linguistic material which both the experimenter and his subject share, but which are not more widely shared in the general population. Towards this end, research with less literate groups helps to ‘make the familiar strange’ and enables us as researchers to see, and thereby evaluate, our implicit assumptions about language and how it relates to reasoning.

Apart from this more general motivation for studying unschooled subject populations, there are internal motivations. The first of these is the narrow range of materials used in reasoning studies with unschooled subject populations. Data has mostly been collected in syllogistic-type tasks (Luria, 1976, Scribner, 1997, Hamill, 1990, although Cole et al, 1971, and Willemsen, 2001, also investigated conditional, conjunctive and disjunctive arguments), with a specific focus on the points of divergence from a normative/competence model. Roughly, when pre-

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1The range of cognitive tasks investigated is broader, however, in other areas of study of cross-cultural cognition (Berry, 1971, Rogoff, 2003, Norenzayan, 2006, for instance).
1.1. Previous work on logical reasoning

The seminal empirical study of the effect of literacy level on cognition was conducted by Alexandr Luria in 1930’s Soviet Russia, at Vygotsky’s suggestion. Luria saw his research as a means to verify the social-psychological thesis that “all fundamental human cognitive activities take shape in a matrix of social history and form the products of sociohistorical development” (1976, Preface, p. v). To conduct his study, Luria traveled to remote regions of Uzbekistan and Kirghizia where radical social and economic restructuring was going on at the time, part of the implementation of Stalin’s first five-year plan. Included in the plan’s aims were the elimination of illiteracy, and a transition to a collectivist economy, both of which required the large-scale introduction of schools with adult literacy programs and short-term courses for specific skills training, in rural areas. Luria wanted to see what the effects of these practices of literacy and of new economic activity, would be on individual thinking. He tested his subjects on a range of tasks, intended to chart diverse cognitive activities such as perception, generalisation, classification, deduction, reasoning, imagination, and self-awareness. Because of the politically sensitive nature of his findings, he did not publish them until much later, in the seventies, after he came into contact with Michael Cole.

Cole and his colleagues were by then participants in the burgeoning field of cross-cultural psychology (see for instance Cole & Scribner, 1974 or Berry
& Dasen, 1974) and conducted experimental studies aimed at replicating and furthering Luria’s results. Cole et al (1971), for instance, reports on tests with logical problems with conjunctive, disjunctive and conditional premises. The results were mixed but in all studies conditional premises generated the most correct responses – a finding which anticipates the results of the current study. One interesting deviation to this is in subjects’ explanation of their answer once they had given it. Here, Cole et al found justifications to conjunctive-based conclusions to be more often correct (58% in non-literate adults) than those for either conditional (24%) or disjunctive based conclusions (29%). Unfortunately Cole et al do not specify the criteria by which responses were judged correctly so it is difficult to interpret these results further. Cole et al’s conclusion was rather less equivocal: “The subjects were not responding to the logical relations contained in the verbal problem. Rather they were . . . responding to conventional situations in which their past experience dictated the answer” (Cole et al, 1971, p. 188). To anticipate slightly: in much the same line of thinking as Luria, Cole et al suggest that reasoning based on logic and reasoning based on past experience are mutually exclusive. They go on: “In short, it appears that the particular verbal context and content dictate the response rather than the arbitrarily imposed relations among the elements in the problem.” (ibid. p. 188).

Cole conducted much of his later experimental work with his colleague Sylvia Scribner, in Liberia, among the Kpelle and Vai peoples in the 1970s and 1980s. Scribner in particular focussed her investigations on reasoning skills and the tasks used to test them. In what follows I will analyse in greater detail the studies reported in Luria (1976) and Scribner (1997), and will refer to Cole et al (1971) only inasmuch as their conclusions diverge from Luria’s. Other references, such as Hamill (1990) and Willemsen (2001) are not discussed further because they are judged to have sufficiently similar approaches and results to Luria (1976) to not warrant separate study.

Both Luria and Scribner tested their subjects on a range of cognitive tasks but within reasoning focussed on syllogistic-type tasks with a quantified or generalised ‘major’ premise and a particular statement as the ‘minor premise’, followed by a question. An example is:

All bears in the far north are white. Novaya zemlya is in the far north. What colour are the bears there?

Scribner reports on a slightly broader range of materials, including major (initial) premises of the form,

2A sample (disjunctive) item is:

Flumo or Yakpalo is in the house. Flumo is not in the house. Where is Yakpalo?

3Note that what in this literature is labelled a syllogism is a far broader class of problem than strictly understood by the term. For him, a pair of premises, in which the first is “in the nature of a general judgement” – for example, ‘Precious metals do not rust’ and the second is a particular proposition, such as ‘Gold is a precious metal’, qualify as a syllogism.
1.1. PREVIOUS WORK ON LOGICAL REASONING

A dog and a horse are always together,
If Sumo or Saki drinks palm wine, the town chief gets vexed.

For discussion on the significance of these different premise forms please see the next chapter. In the experimental study reported here all syllogistic tasks used quantified statements in the premises.

<table>
<thead>
<tr>
<th>group/solution</th>
<th>type of syllogism associated with experience</th>
<th>not associated with experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>illiterate peasants *</td>
<td>9 (60%)</td>
<td>2 (15%)</td>
</tr>
<tr>
<td>– immediate solution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– after conditional assumption †</td>
<td>6 (40%)</td>
<td>4 (30%)</td>
</tr>
<tr>
<td>young people ‡</td>
<td>15 (100%)</td>
<td>15 (100%)</td>
</tr>
<tr>
<td>– immediate solution</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1.1: Luria’s results (1976, p 116):
*from remote villages (15 subjects); †“from your words I gather that . . .”, and note that this category cumulates with those solved immediately; ‡with short-term education, farm activists (15 subjects)

<table>
<thead>
<tr>
<th>% type of justification</th>
<th>theoretic</th>
<th>empiric</th>
<th>arbitrary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kpelle villagers</td>
<td>22.3</td>
<td>68.1</td>
<td>9.6</td>
</tr>
<tr>
<td>Kpelle students</td>
<td>75.0</td>
<td>21.9</td>
<td>3.1</td>
</tr>
<tr>
<td>American students</td>
<td>82.3</td>
<td>3.1</td>
<td>14.6</td>
</tr>
</tbody>
</table>

Table 1.2: Scribner’s results (1997, p112)

As for their findings, tables 1.1 and 1.2 give the precise percentages garnered in Luria’s and Scribner’s studies. The tables should be read with the following in mind. Scribner reaches her categorization by classifying the justifications given to initial yes/no answers as follows: included in the category theoretic are “statements explicitly relating the conclusion to the information contained in the premises”; empiric, “statements justifying the conclusion on the basis of what the subject knows or believes to be true”; and finally, arbitrary covers irrelevant, idiosyncratic and “don’t know” responses (in further studies, Scribner absorbs the ‘I don’t know’ answers into ‘empirical’ – for example in Scribner, 1997, p. 130). Luria is not explicit about his classification, although the role of justifications for yes/no answers is certainly a factor in determining whether the subject ‘solves’ the task or not. One would assume that ‘solution’ means giving what is in Scribner’s terms a ‘theoretic’ justification, but note that all syllogisms
‘associated with experience’ are solved when the experimenter stresses the qualification “but what can you conclude, on the basis of my words?” This suggests that ‘empiric’ justifications might also be counted as solutions for Luria in this class of problems. A reason for the more equivocal results garnered by Scribner might be her wider range of premises – the significance of which we will come to later on in the chapter. What is interesting is that Scribner, and Luria as far his categories align with Scribner’s, take for granted that the categories “theoretic” and “empiric” are mutually exclusive. Not only do some subjects give ‘mixed’ answers which make reference both to personal knowledge and to information given in the premises – see Khamrak’s last turn in the opening dialogue, repeated below – but, as is detailed further on, most answers are necessarily mixed, since personal, and sometimes not-so-personal, knowledge influences how subjects interpret the premises.

Let us take another look at the exchange opening the first chapter and see how it illustrates the type of response Luria and Scribner reported.

**Khamrak, aged 40 years, illiterate:**

E: In the Far North, where there is snow, all bears are white. Novaya zemlya is in the Far North and there is always snow there. What color are the bears there?

S: I don’t know what color the bears are there, I never saw them.

···

E: But what do you think?

S: Once I saw a bear in a museum, that’s all.

E: But on the basis of what I said, what color do you think the bears are there?

S: Either one-colored or two-colored ... [ponders for a long time]. To judge from the place, they should be white. You say that there is a lot of snow there, but we have never been there!

The first thing which springs out is an obvious discrepancy in understanding of the discourse: what the experimenter intends for the subject to understand is patently different from what the subject understands is required from him. This is addressed in the next chapter. Notice however, that perhaps even inadvertently, the subject gives the ‘right’ answer the experimenter is looking for – ‘they should be white’ – albeit with a justification which is ambiguous as to how exactly the inference is drawn from the premises.4

As already mentioned, the responses show remarkable patterning when considered together. In both Luria’s and Scribner’s studies, the majority of responses to the syllogistic problem fall into one of two groups. Most common, according to Luria, was a refusal to give a positive answer because of a lack of personal knowledge of the premises (“I don’t know what color the bears are there. I never

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4Does the subject infer for himself that because there is snow, the bears should be white, or does the subject rely on the experimenter’s relating of the snowy environment to the colour of the bears?
saw them.”). Scribner also reports this type of response as most common. To the problem

‘All Kpelle men are rice farmers; Mr Smith is not a rice farmer. Is he a Kpelle man?’

she heard the following answer:

S: I don’t know the man in person. I have not laid eyes on the man himself.
E: Just think about the statement.
S: If I know him in person, I can answer that question, but since I do not know him in person I cannot answer that question.

Refusal to answer is the initial response for the majority of subjects. Luria summarizes thus:

“The most typical responses of the subjects, therefore, were a complete denial of the possibility of drawing conclusions from propositions about things they had no personal experience of, and suspicion about any logical operation of a purely theoretical nature” (1976, p. 108).

I will argue that the characterisation of the ‘I don’t know; I can’t answer that’-type response as refusal to engage with premises is inaccurate and that such answers are the product of a very ‘normal’ engagement with the premises. The label ‘refusal’ should be read not as refusal to engage with the premises, but as ‘refusal to give a definite answer’, for good reason, in a way that is laid out in more detail in the discussion section of this chapter. For now, it bears noting that ‘refusal’ does not indicate that there is no reasoning going on in the subject’s head – as the last turn in the excerpt from Scribner amply illustrates!

A second type of response observed was an engagement with the premises, on the subject’s own terms so to speak: that is, by expanding and/or fitting them to (presumably) known and accepted conventional situations. Here it should be noted that the subject often constructs sophisticated logical argumentation with a combination of the given premises and their own additions to these. This type of response doesn’t seem to arise immediately, but only after repeated questioning by the experimenter. This is illustrated in the above transcript of Luria’s conversation with Khamrak (p. 108), as well as in the following, in response to the problem

‘Cotton can only grow where it is hot and dry. In England it is cold and damp. Can cotton grown there?’

a subject responds (after first answering ‘I don’t know’):

Abdurakhm, 37, illiterate.

S: I've only been in Kashgar country; I don’t know beyond that.
E: But on the basis of what I said to you, can cotton grown there?
S: If the land is good, cotton will grow there, but if it is damp and poor, it won’t grow. If it’s like the Kashgar country, it will grow there too. If the soil is loose, it can grow there too, of course.

Here the subject appears to realise the experimenter is expecting him to draw conclusions beyond his personal knowledge, and does so, but by means of the introduction of adapted conditional premises, which presumably can be accepted on the basis of personal experience (‘If it’s like Kashgar country...’). Luria has a dim view of such performances: “Frequently they completely ignored the premise and replaced the inferential process by considerations of their own, for example... they would introduce general, rumor-based opinions... In short, in each case, they would avoid solving the task” (1976, p. 107)

At this point I can’t help but to anticipate the current analysis: this is a serious under-evaluation of the subjects’ performance, as will become evident in the rest of this chapter and the next. The subject engages with the premises – but, again, has to interpret them first. Luria’s argument has a hiatus where the step from presented material to interpreted material, the ‘logical form’ that the subject reasons with, should be. Such a hiatus is more generally evident in the reasoning of researchers in this area, and revealing and repairing it is really one of the main aims of this dissertation.

Getting back to the matter at hand, the findings so far need to be summarized. According to Scribner and Luria’s conclusions, there are two main characteristically unschooled responses to the reasoning problem. The most common initial reaction is one of refusal to answer on basis of the premises because of a lack of personal acquaintance with them. The second type of reaction is engagement with the premises on a ‘personal’ level: adapting the premises to align with one’s own knowledge, or conventional wisdom, even including them in a narrative form of discourse. For Luria (1976), the results showed that illiterate subjects did not grasp the logic of the syllogism: they “are not perceived by these subjects as unified logical systems.” [p. 106] These subjects are limited to concrete, situational thinking, incapable of abstract thought. On the other hand, subjects with “well-established forms of theoretical thinking”, those with even a short (1-2 years) time in school education, “tend to grasp the over-all logical structure” (pp. 103/4). For Luria, these findings provided evidence of the deep impact of literacy on forms of thinking. He concludes his study with the following summary: “as literacy is mastered, and a new stage of social and historical practice is reached, major shifts occur in human mental activity. These are not limited simply to an expanding of man’s horizons, but... radically affect the structure of cognitive processes” (p. 161). Crucially, though, Luria’s conclusion is unable to explain why in some conditions, and accompanied by certain assumptions, subjects can and do give responses which reflect a grasp of the logical structure of the syllogisms.

Scribner’s (1997) conclusion is more qualified: “In the present analysis, formal
Evidence in a problem controls performance of the schooled groups. The non-schooled groups show no such homogeneity: some respondents appear at either end of the spectrum, handling all problems empirically, or, in fewer numbers, handling them all theoretically. The great majority have a mixed strategy, relying now on the formal information in the problem, now on the evidence external to it (1997, p. 134). This outcome casts doubt on the unequivocal effect of schooling/literacy on reasoning proposed by Luria, and suggests the impact lies more in styles or preferences when approaching a cognitive task. As such, the main achievement of schooled subjects would be merely to make more consistent use of an already (i.e. pre-schooling) available interpretative strategy for drawing an inference. But this does not provide an explanation of what is driving choices in the so-called ‘mixed strategy’ used by unschooled subjects. Rather, our locus of interest is the conditions under which unschooled subjects adopt one or other interpretation of the premises, what these various interpretations are, how they are related to task material, and to more general issues of task construal.

Furthermore, we are interested in whether the response profiles generated on syllogistic-type tasks give a true representation of the logical reasoning ability of unschooled thinkers. Is it really so that unschooled subjects typically refuse to draw conclusions about situations they have never experienced themselves? Or is the difference in the response profile identified by Luria and confirmed by Scribner somehow amplified by the peculiarities of the particular tasks they used? What we really need to know is why such responses are elicited. Why this type of reaction as opposed to some other?

Even so, at this juncture, given the rather non-constructive nature of Luria’s conclusions, and to a lesser extent Scribner’s, the cognitive researcher might be inclined to give up on this experimental paradigm altogether. See for example Dasen’s recommendation (1977, p. 197) that researchers should rather focus on tasks “which test the same cognitive structures, but which are directly relevant to the daily activities and interests of the subjects.” There has been a large research programme in this vein; that is, one that focuses on tasks moulded to the everyday environment in which cognitive development happens, and going so far as to argue that the individual cannot be studied as a separate entity from the culture (Rogoff, 2003, p. 42). Such an approach is certainly valuable and yields very different knowledge but leaves unexplained the differences, and, more importantly, the similarities, between groups on the ‘standard’ cognitive tests. As we will see, the concerns of unschooled subjects in these tests remain similar across very different environments, and this itself argues for their validity.

The current work aims to combine the best of both approaches. The original reasons for the set-up used in the classic studies of Luria, Scribner and colleagues, still stand, namely to use measures of thinking that bore little relation to everyday life, so as to tap inferential ability independently of background knowledge or convention. This may seem to have been unsuccessful, but these studies have not yet had the benefit of a modern treatment based on pragmatic and seman-
tic theory; insights from these areas allow the common basis of response across
groups to be seen more clearly. Our conviction is that there is a common fund-
dament to linguistic ‘culture’ which supersedes other cultural boundaries; hence
that the standard reasoning task is relatable to the everyday linguistic activi-
ties and interests of the subjects – to paraphrase Dasen – and hence still worth
studying.

1.2 Experimental set-up: subjects, protocol, materials

The participants in the current experiment were of varying age and education
level, all resident in the small town of Hamburg on the coast of South Africa’s
Eastern Cape province. The majority of the subjects were employed as beaders
or embroiderers in the local art project. Three of the women worked as domestic
help; several were unemployed. Of the 29 subjects, six had had no education
at all, thirteen had less than ten years of education, and had been out of the
education system for more than ten years, and ten had completed high school
within the last 20 years. I will maintain these three groupings when discussing
my data:

**Group 1:** No education (6 subjects)

**Group 2:** Between four and ten years of education, left the educational
system more than ten years ago (13 subjects)

**Group 3:** Graduated from high school within the last twenty years (10
subjects).

All subjects were interviewed individually, in Xhosa. Each interview lasted
approximately 30 minutes and participants were paid R20 for taking part. The
translator, Zukiswa Pakama, was a Hamburg resident, well-known to most of the
subjects. Pakama is a native Xhosa speaker but attends university (in English) in
nearby East London and speaks fluent English. The interviews were video-taped
and later transcribed. At the beginning of each interview, the subject was asked
about their age, language skills and educational history. Then the tasks were
introduced by saying that the experimenter wanted to see how the subject used
language and would describe situations and ask them questions on the basis of
these. It was emphasised that there were no right or wrong answers and that the
primary interest was how they used Xhosa.\(^5\)

The materials used in the interviews were drawn from the range of tasks previ-
ously used in psychology of reasoning studies, including syllogistic-style material
*à la* Luria and Scribner’s version of the syllogism, such as:

\(^5\)Not being a Xhosa speaker myself I thought this would help mitigate against potential
authority issues in the situation.
Suppose there’s a faraway country called Markia.
All the women in Markia are married.
Fatma is a woman who lives in Markia.
Is she married?

and conditional reasoning material, such as used in the suppression effect task, viz:

Suppose there’s a girl called Thembi living in Hamburg.
If Thembi wants to see her boyfriend, then she goes to East London.
(If Thembi has enough money, then she goes to East London.)
She does want to see her boyfriend.
Does she go to East London?

These two sets of materials were considered of primary interest, given their importance in previous and current theorising about reasoning behaviour (Luria, 1976, and Byrne, 1989). Two other tasks were conducted: the quantifier interpretation task, and a thematic version of the Wason selection task. These are not reported on here since the issues they raise differ considerably from those we are currently concerned with.

1.3 Results and discussion

In this section the aim is to get behind the categorization given by Scribner and Luria of unschooled reasoning performance. This is tackled by a two-fold strategy for both the syllogistic and conditional material. As to be expected, observed phenomena mostly do not restrict themselves to one or other type of premise material, so the consideration of the two separately is somewhat artificial. However, this is counteracted by mentioning explicitly when a phenomenon occurred predominantly in response to only one or other type of material.

Firstly, new data from syllogistic-type tasks is analysed, primarily by identifying to what extent it is comparable to data gathered by Luria and Scribner. Once this is established, I set out to explain the categories defined by Luria and Scribner in terms of reasonable semantic interaction with the premises. Secondly, I present and analyse data from the conditional premise set, by the same strategy. This enables us to get some insight into difficulties associated with specific task materials, an issue which is taken up more fully in the next chapter.

Although some quantitative results will be given, these should be seen as a means to better contextualise the qualitative results, and not an end in themselves. The aim is not to provide a comparison of accuracy between subjects, as defined by some predetermined competence model, but to uncover the range of factors influencing subjects’ interpretations of the material and the kind of role these play in generating responses. A full understanding of subject behaviour is
considered to be only possible when such interpretative factors have been taken into account.

There are several remarks to be made at the most general level. Firstly, the distinction between groups was not as sharp as Luria found it to be, especially with conditional reasoning premises. As the table indicates, qualified or elaborated answers occurred consistently across all groups with conditional premise material. This contrasts with the response pattern for syllogistic-type material, which was much more differentiated by group. (See table 2.1). This finding is in line with that of Scribner’s study (1997, p. 112) which also included some conditional material as described above.

Secondly, and related to this, there was heterogeneity within groups, and particularly within the schooled subjects (group 3), more so than identified by either Luria or Scribner (e.g. Nomalungisa, Nokuhula). Recall Scribner’s summary of her finding: that “The great majority [of unschooled subjects] have a mixed strategy, relying now on the formal information in the problem, now on the evidence external to it.” (Scribner, 1997, p. 134) The current results are consistent with this finding, but do not align as well with Scribner’s finding that “formal evidence of the problem controls performance of the schooled groups.” But this is not the first registration of a more heterogeneous response within the schooled group. Tulviste’s (1991) experimental study, also with a more varied range of premise materials, among subjects from a similar range of educational backgrounds, reports remarkably comparable findings. Although Tulviste found the correlation between number of correct responses and educational level of the subject to be statistically significant , he also found that “In many cases, the protocols of the subjects who had attended school for quite a long time and those who had not attended school at all were practically identical” (Tulviste, p. 134). As an example he cites the responses of a 26-year old subject with 10 school grades to the following problems:

Every morning Asan plays on the kamuz [a Kirghiz musical instrument].
Did Asan play his kamuz yesterday morning or not?

S: How should I know?
*The problem is repeated.*
S: Maybe he did play.

Asan and Kenesh always drink tea together. Asan is drinking tea now. Is Kenesh drinking tea now or not?

S: No, he’s not.
E: Why do you think so?
S: Because he may not be there now.

These two responses fall squarely into the categories given by Luria to describe illiterate performance: to paraphrase him, the subject “ignores the premises or replaces them with considerations of his own.” Yet this is a subject with ten years or more of schooling. Scribner already observed that villagers who had
attended school more than ten years previously and has since returned to with rural life responded more like unschooled subjects; so this is not surprising with respect to my group 2, nor with respect to group 3. Both Luria’s and Scribner’s schooled subjects were either still attending or had very recently left the educational system, whereas in the current study many of the Group 3 subjects left school several years ago. But this is by no means a complete explanation, as one of my subjects, Thembakazi, illustrated. Thembakazi was still in high school when she participated in the experiment, yet gave responses usually associated with unschooled subjects, namely changing the status of the antecedent from hypothetical to actual and elaborating on the given premises, viz:

**Thembakazi, group 3:**

(After simple condition: If Ntombi wants to see her boyfriend then she goes to East London. And she wants to see her boyfriend. Does she go to East London?)

E: And what if we know that if Ntombi has enough money for taxi fare, then she goes to East London? And she wants to see her boyfriend.

S: She will go, because she’s got the taxi fare.

E: And what if she doesn’t have the taxi fare?

S: If Ntombi doesn’t have the taxi fare, and she wants to see her boyfriend, then she will borrow some money from somewhere else, and go to East London, if she really wants to see her boyfriend.\(^6\)

In this case, Thembakazi was sitting in the room with her grandmother and principal guardian Susan, and I later found out that there have been heated domestic discussions about exactly such situations. It seems likely therefore, that Thembakazi was addressing her defiant answers not only to the experimenter but to her grandmother too! In the majority of her responses Thembakazi gave ‘theoretic’ responses, which sometimes contradicted factual knowledge – ‘snow is black’ in one condition – thus illustrating that the adoption of a particular mode of response is fairly shallow and dependent on particular aspects of a condition. Such cases remind us of the matter of task construal, i.e. what kind of discourse the subject assimilates the material to, and the contribution that contextual and individual factors may make to this.

\(^6\)There were other school-going subjects who gave such responses – for example:

**Abongile, group 3:**

E: Ok next one. Ntombi’s boyfriend lives in East London. If she wants to see her boyfriend then she goes to East London. So today she wants to see her boyfriend. Do you think she goes to East London?

S: I don’t know.

E: Is it a strange question?

S: No, it’s not but I don’t know.

See also transcripts from Nozuko later on.
CHAPTER 1. LOGIC, LANGUAGE AND KHAMRAK

For both Luria and Scribner the choice for one or other strategy – “theoretic” or “empiric” – is considered to be a function of the subjects’ epistemic relation to the material: whether she or he is ‘familiar’ with the described situation, and if so, whether it contradicts reality as known. Luria’s presentation of results attests to this; and Scribner sums up her findings with: “Adoption of a particular mode is influenced [by] ... especially the factual status of the information supplied in the premises” (1997, p. 134-5). As will become evident, the relation is somewhat more complicated than this allows, since the subjects’ response is shaped by the specific semantic structure they discern in the material. Subjects respond to material first and foremost by interpreting it, not just by accepting or rejecting it.

On the other hand, as we will see, several subjects exhibited consistent patterns of response, indicating that they attributed a stable semantic structure to an argument form with varying content. In some cases the subject gave consistently “theoretic” answers (Novuyani, Sebenza, Notuthuzelo); other subjects consistently volunteered different kinds of extra information in their responses (Zukiswa, Nomhle) – behaviour which Luria might have classified as “replacing the inferential process by considerations of their own” but which will here be interpreted more favourably. Individual subjects who repeatedly gave answers of a similar form are discussed in more detail as we get to each of these forms.

For comparative purposes a table summarising one aspect of the data is presented: the proportion of initial responses which are characterisable in Scribner’s terms as ‘theoretic’. By initial responses, it is meant: only the responses to the initial modus ponens question or the basic syllogistic question (All A are B, x is A, is x B?). This is judged to be most comparable to other data, and least affected by the vagaries of a specific interaction. Everyone has heard the same story at the point when these answers are given. Once a conversation has started the task of the subject becomes more open-ended and to compare later responses to a posited norm would lead to distortions in the data, if the foregoing conversation is not taken into account.

The rate of immediate elicitation of correct answers for the syllogistic task in the unschooled group was 30% – comparable to Luria’s and Scribner’s findings.

<table>
<thead>
<tr>
<th>Group</th>
<th>quantified premises</th>
<th>conditional premises</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ratio</td>
<td>percentage</td>
</tr>
<tr>
<td>1</td>
<td>7/23</td>
<td>30%</td>
</tr>
<tr>
<td>2</td>
<td>25/38</td>
<td>66%</td>
</tr>
<tr>
<td>3</td>
<td>24/33</td>
<td>73%</td>
</tr>
</tbody>
</table>

Table 1.3: Comparing initial responses across premise forms
of 40%\(^7\) and 22.3% respectively. As for the conditional elicitation rates, the only figures with which to compare them would be those from studies with undergraduate students, which have been typically somewhat higher (e.g. 96% in Byrne, 1989), but this might again be a ‘literacy’ effect. But most interestingly, the results tabled show a discrepancy between the groups according to the type of premise they had to reason with. Conditional premises proved to be easier than quantified premises across the groups, and, as we’ll see when looking at justifications, show less variation across groups – something which might explain the more muted group differences found by both Scribner and Tulviste.

Further what does a table such as 1.3 really tell us about illiterate reasoning? Very little. In fact, the main goal of this chapter is to deconstruct this and similar presentations of results to reveal the similarities of category of concern across schooled and unschooled groups when it comes to determining the semantic structure of the premises. The eventual aim would be to construct another table based on just these categories, what might be called ‘semantic parameters for reasoning’, which underlie the results presented in the form of tables 1.1, 1.2 and 1.3. These will range from general concerns with the hypotheticality of the premises, the informational structure of the task, epistemic access to the premises, to more specific concerns such as the appropriate interpretation of a generalisation. After all, as Scribner already pointed out,

> Before drawing conclusions about the subject’s reasoning processes, then, the investigator must determine what problem the subject is actually attempting to solve. (Scribner 1997, p. 108)

### 1.3.1 Syllogistic-style task results

In this section the data is analysed by addressing the following questions, generated by the new data or left unanswered by previous studies:

1. to what extent are the categories of response above evident in syllogistic-type tasks in the current study?

Regarding the ‘refusal or elaboration of premises’ phenomena:

2. why do subjects refuse to reason with given premises? do only unschooled subjects do so?

3. do individual subjects consistently refuse to reason with the premises or is refusal related to particular materials and inferences?

4. why do subjects go beyond the given premises when reasoning, assimilating them to their own experience? again, is this phenomenon associated only with certain groups, materials or inferences?

\(^7\)This is a composite figure, based on 9/15 for syllogisms “associated with experience” and 2/13 for those “not associated with experience” (Luria, 1976, p116).
As to the specific formulation of premises:

(5) what is the interpretation of the quantified statement assumed by the subject? can this explain the ‘elaboration’ phenomena mentioned above?

(6) does the interpretation of the quantifier vary across materials – for instance more or less plausibly law-like generalisations – and if so, does it do so consistently across subjects and or/groups?

And with respect to more general task construal issues:

(7) to what kind of discourse do subjects assimilate this kind of material? is there evidence that they reflect on the purpose of the discourse and the ‘naturalness’ of the premises?

The syllogistic materials were comparable to those used by Luria and Scribner, and the subjects were comparable in terms of literacy levels, but in other potentially operative respects (language, economic activity, cultural milieu – e.g. access to ‘literate’ mediums such as television) the subjects in the current study differed from both Luria’s and Scribner’s subjects. Note that these groups are, in turn, also different from each other. The circumstances of the three testing situations differ along several dimensions, such as historical and geographical setting (more or less isolated communities, familiarity with visiting researchers), but also the experimenter’s relation to the subjects, and the available recording equipment. Given these discrepancies in the subject groups and testing situations one might expect the data to be barely comparable across groups. What is striking is the extent to which the data are comparable. Scribner herself considers an even wider range of studies and concludes:

“the consistency of the basic findings is impressive. Not only are the quantitative results strikingly uniform . . . but certain qualitative aspects of performance are so similar that it is often difficult to distinguish the translated interview protocol of a Uzbekistanian from that of a Vai – cultural and geographic distance notwithstanding.”

In the current study it is even more remarkable that the interviews yielded comparable data because the subjects’ daily activities and cultural milieu was so different from that of either Scribner’s or Luria’s subjects. For starters, the subjects in the current study live in a mixed and dynamic community, with much urban contact – the city of East London is only an hour’s travel away – and are familiar with modern media such as newspapers, television, even mobile phones. Think again of Luria’s hypothesis, that “all fundamental human cognitive activities take shape in a matrix of social history and form the products of sociohistorical development”. Now even though each subject group considered here has had a different social history, their cognitive strategies as measured by these tasks prove to be comparable. This suggests that there are but a few factors which have
1.3. RESULTS AND DISCUSSION

a non-zero value in the matrix that Luria talks of – the foremost of these being education, and paired with this, literacy. The mechanisms, through which these factors operate to influence cognition, are explored further in the next chapter.

The applicability of Luria’s/Scribner’s classification

As table 2.1 preliminarily indicates, the data obtained in the current study are highly comparable to Luria’s and Scribner’s data. Specifically, many subjects exhibited what Scribner called ‘empirical bias’, although mainly in the second sense of assimilating the premises to own experience. Few outright refusals to reason with the given materials were observed. The few came from the older subjects who had had no education at all. This second aspect of the empirical bias was much more prevalent and was also present in all groups. This is a point at which my data differs from Luria’s but aligns with Scribner’s results. Also, recall Tulviste’s (1991, p. 134) reporting that “In many cases, the protocols of the subjects who had attended school for quite a long time and those who had not attended school at all were practically identical”. As mentioned above, the prevalence of ‘mixed’ responses even in the most schooled group in the current study is probably partly a recency of schooling effect, as described in Scribner, 1997, and partly a matter of the expanded test material. An example illustrates:

Nozuko, group 3:

E: Suppose all the women in Nigeria are married. Now there’s a woman called Connie and she’s not married. Can we say she lives in Nigeria or not?
S: What kind of clothes do they wear in Nigeria?
E: Just suppose the world is a strange one in which all the women in Nigeria are married.
S: We can say she’s a Nigerian but she hasn’t got married yet.

The classification of such a response as an unschooled-type response, with attendant connotations of defective reasoning, is fitting in Luria’s terms – recall his description of subjects who “replaced the inferential process by considerations of their own”. But this is also a fine example of what will here be argued to be a very reasonable, even pressing, tendency of subjects to reckon with or enquire after a basis on which the quantification is justified, and thus what kind of semantics it should get. Nozuko’s last turn in this exchange can be seen as making a case for why a law-like reading universal quantification doesn’t make sense: at any point there will be young women who are yet to be married, who are nevertheless falling into the domain of quantification by living in Nigeria. Compare this to the intended reading of the quantification for correct performance in the task.

Note that in Xhosa custom a married woman indicates her status by wearing a specific kind of dress: she always covers her head, and wears an apron. There is also special language only for married women: some objects (e.g. cattle, stones) have two names, one for use by married women, one for use by everybody else.
premise “All women in Nigeria are married”, like the premise “All bears in the far north are white”, needs to be interpreted on a universal domain, and strictly – not tolerating exceptions. As will become clear in the next chapter, this is a highly uncommon and contrived use of the term. In its everyday use, quantification is explicitly or implicitly subject to domain restriction. Sentences like “Everyone came to the party” illustrate: “everyone” is clearly intended to refer to a very restricted set of people; an unrestricted-domain reading is as good as unintelligible. So the rejection of a universally quantified statement might be better viewed as the attempt to clarify domain restriction. Further, it can either be read as a law-like or accidental generalisation, but both of these are problematic as they either result in the correct response being uninformative or unfounded, as will be elucidated in the next chapter. What is key is to understand that the correct answer is not informative in the standard sense, but only informative about the knowledge state of the respondent. We should understand the exchange not as a failure of the subject to “accept the logical task” (Scribner, 1997), but as a negotiation between subject and experimenter as to what the logic of the task is.

Indeed, stripping the evaluative layer from the categorization given by Luria and Scribner reveals the concern for semantic factors which has been identified elsewhere and in different subject groups. Luria lists three factors which he judges to limit capabilities for theoretical, verbal-logical thinking, and which lead to the responses as categorised. Firstly, subjects “mistrusted” the initial premise. Under this he subsumes also refusal to answer and ignoring of the premise altogether. Secondly, subjects do not accept the premises as universal. “Rather they were treated as particular messages reproducing some particular phenomenon.” Thirdly, subjects did not treat the premises as forming a unified set, but as “three independent and isolated particular propositions with no unified logic.” Observe that the first two of these factors can equally well be uniformly explained by the concerns described in the previous paragraph, in that instance articulated by a schooled subject. That is, “mistrust” of the initial premise and failure to treat it as universal is actually a result of uncertainty about the appropriate domain and type of quantification intended, including the means to verify it. This last could explain the many responses along the line of “I don’t know; I’ve never been there/met the man”, that is, under a contingent reading of the quantifier, in which all instances need to be verified before the generalisation can be. Allied to this, taking the contingent reading of the generalisation decouples the intended relation between the two premises, and thus could explain what Luria diagnoses as failure to treat the premises as a uniform set. Please see the following chapter for a full description of this phenomenon.
The ‘refusal’ phenomenon

There were very few cases, as mentioned, of flat refusal to reason with the premises. When this did occur, it was after the first question, right at the beginning of the interview, in both cases with conditional premises. It only happened with unschooled subjects. In one other case, the subject at first answered, and then refused to answer at a later point in the exchange:

Susan, group 1:

E: Another one. Remember that it doesn’t matter if it’s true or false. Just listen to the words. Suppose all the birds in Cape Town are penguins. (translator has to explain what they are; subject nods). If someone sees a bird in Cape Town, what kind of bird will they see?
S: When she sees it in Cape Town?
E: Yes. Repeats question.
S: It could be a dove, or a raven, or a swallow.
E: But ignore what the real world is like, and just pretend that all the birds are penguins in Cape Town, then if you see a bird, what kind of bird is it?
S: It will be a bird, maybe a dove or any other kind of bird.

... 

E: Imagine we are talking about the North Pole, and I tell her that all the birds there are penguins. If you see a bird there, what kind of bird will you see?
S: I don’t know.
E: And if I tell you all the birds there are penguins?
S: I don’t accept that.
E: Why not?
S: I don’t know these penguins, I’ve never seen them.

9Here are two examples. On being asked whether Ntombi would go to East London, Susan replied:

Susan, group 1:

S: How will I know? I don’t know.
E: If you just listen to the words, and to the situation they are describing, an (repeats question), will she go then? We are not referring to a specific person here.
S: I don’t think she will go because her mother is watching her and not letting her go.

And another example, this time in a story about a girl called Ayanda:

Vulelwa (group 1):

S: I don’t even know this Ayanda, and I don’t know if she will go to East London. Does she live in Hamburg, this Ayanda?
This last turn resembles the answers garnered by Luria and Scribner as initial responses and here forms an interesting contrast with the response offered in the more familiar setting of Cape Town.

What also might be contributing to Susan’s answer is a lack of the relevant taxonomic knowledge: that penguins are a type of bird, distinct from say doves, ravens and swallows. Although the translator explains this to her, describing the different appearance of the birds, she might still not ‘get’ the categorization. This might also have been a factor in Luria’s study: with premises such as “Precious metals do not rust” we might well wonder whether subjects have the concept “precious metals” at all, and thus what meaning such a premise might have for them. See further discussion on this topic in the section on familiarity issues, and in Chapter 4 on literal meaning.

More generally, characterisation as refusal to reason is only accurate when the subject is assumed to have taken the intended interpretation of the premises, but, as the next chapter will show, this assumption is not generally warranted. The intended reading, in which the universal generalisation gets a law-like reading, is highly contrived and infrequent in spontaneous speech. Moreover, taking this reading results in a question-answer pair with an abnormal epistemic structure. This kind of question-answer is possibly dominantly used in schooling environments, so that unschooled subjects may dismiss the intended reading, if they consider it, because they fail to recognise the task as best fitting into the test discourse genre, with its peculiar epistemic structure.

What unschooled subjects are likely to be doing is interpreting the universal generalisation, in the way it would be in everyday discourse, and the question in line with normal question-answer structure. If this is the case, then ‘refusal’ answers are very much answers on the basis of the given premises, and as such evidence of reasoning as much as a schooled “yes” would be. Luria’s equivocation of refusal to give a definite answer with refusal to engage with the premises stems from his failure to take interpretative processes into account, so that he cannot see a gap between the presented premises and his own (or someone else’s) interpretation of them. In fact, the premises need a highly specific interpretation to get to the ‘correct’ answer.

There were few further subjects who gave an outright refusal to answer the question as posed. This might be a matter of politeness, of cultural norms, familiarity with other media, or of the relatively higher tolerance of my subjects to strange questions – the majority worked on an art project which had a continuous stream of foreign visitors and a documentary had recently been made about the town, for which some of the older subjects had been interviewed and thus could have gotten used to answering strange questions! More seriously, outright refusal was, as described, given as an initial response but subjects mostly consequently participated further. As such, refusal should perhaps primarily be regarded as a feature of task construal in the broadest sense, which, although influenced by the premises, had more to do with the whole setting of the experiment. (Reasons for
refusal related to the exact premises are discussed in greater detail below, in the paragraph 'The role of experience'.

“Failure to accept” the given premises

The second feature of unschooled subjects’ reasoning was broadly characterised by Luria as “failure to accept the premises” as given. This includes ignoring, rejecting, distorting, and elaborating on given premises. Note that, once again, this is only an accurate description when the subject is assumed to have the intended interpretation of the premises.

Ignoring the premises occurred in extreme varieties in the responses of only a couple of subjects, but within these quite consistently. For example, Susan was interviewed twice. The first reply in her first interview was reported above. She continued to give such answers throughout the first and the second interview, often seeming to ignore the given premises altogether. Here is another example of Susan ignoring premises, this time from the second interview:

Susan, group 1:

E: Next one. It’s about the moon and on the moon all the stones are green. And a man goes to the moon and he finds a stone there. What colour is that stone?
S: *It’s white and shiny.*
E: How do you know?
S: I just think that.
E: But remember, I said that all the stones are green there.
S: Yes.
E: So do you still think it’s white?
S: It’s only this one that’s white.

In this case the subject’s response cannot so easily be explained by a case of lack of taxonomic knowledge. She seems to truly not engage with the premises as a logical unity, and at first appears to ignore the first one altogether. My honest impression with this subject was that she simply wasn’t paying much attention at this point. She often seemed bored and indicated that she found the questions rather bizarre. A lack of understanding of the experimenter’s intentions and the aim of the interaction could certainly play a role in many illiterate subjects and cause them to be less attentive than they might otherwise have been, had the goal of the interaction (and their role in it) been clear to them.

Another subject who consistently gave Luria-style refusals to reason with the given premises or reasoning on the basis of personal knowledge was Vulelwa – see the following two excerpts:

Vulelwa, group 1:

E: Now suppose there are no cows in the whole of the Eastern Cape. And Hamburg is in the Eastern Cape. Will there be cows in Hamburg?
S: Because of what?
E: Just suppose that something happens, and there are no cows, in the whole of Eastern Cape. And Hamburg is in the Eastern Cape. So will there be cows in the Eastern Cape?
S: There may be cows.
E: Why?
S: There may be cows. If you say there are no cows in the Eastern Cape, there may be cows in Hamburg, even though there are no cows around Hamburg.
E: Even though Hamburg is in the Eastern Cape?
S: Yes.

... 
E: Now suppose there are no cows in England. And there is a place in England called Fawley. Will there be cows there?
S: I don’t know.
E: But what if I tell you there are no cows in the whole of England, and Fawley is in England. Will there be cows there?
S: This question is so difficult.
E: OK. I’ll repeat it. In England, and the whole of England is an island, there’s no cows. Now there’s a small town on the island, called Fawley. Will there be cows there?
S: No, there are no cows there.
E: Why?
S: Because you say it’s a small town and there’s no grazing fields there.

We now address these types of responses in detail, again with the aim of uncovering semantic reasons for such responses, thus allowing us to understand them more constructively and on a continuum with schooled responses.

The role of experience

Content effects are well-documented in reasoning research. Belief bias phenomena (Oakhill, Johnson-Laird & Garnham, 1989) and typicality effects (Sloman, 1998) are two-well known examples of highly literate subjects reacting to quantified premises on the basis of their own understanding of them. With illiterate subjects content effects also operate, seemingly to an even greater degree, under some conditions. Luria’s assessment is that there was typically “complete denial of the possibility of drawing conclusions from propositions about things [the subject] had no personal experience of” (Luria, 1976, p. 108). His results indeed show a marked difference in response on familiar versus unfamiliar materials: of the illiterate subject some 60% solved familiar problems immediately; only 15% solved those “not associated with experience” immediately (p. 116). Familiar problems involved “experience transferred to new conditions” – e.g.

Cotton grows well where it is hot and dry. England is cold and damp. Can cotton grow there or not?

Unfamiliar problems were those “not associated with experience”; an example is the ‘white bears’ syllogism reported in the transcript above:
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In the Far North, where there is snow, all bears are white. Novaya Zemlya is in the Far North and there is always snow there. What color are the bears there?

Young subjects with some education solved both types of problems 100% of the time.

How is this familiarity/unfamiliarity effect comparable to ‘content effects’ identified in other psychology of reasoning studies? Scribner labels it an extreme form of content effect, and labels it “empirical bias” – that is, as it occurs in reasoning studies with literate subjects, the effect of problem content which ‘distracts’ the reasoner from the formal task. In unfamiliar cases the bias is acting to such an extent as to function as what Scribner calls an ‘organiser’, resulting in a judgement that the problem is “in principle unanswerable”, so that the subject does not engage with the premises at all, except to explain why s/he is not able to accept them. Scribner reports that on some problems ‘empirical bias’ entered into 75% of the responses; in others it fell to as low as 30% (1997, p 135). She remarks that this was related to the “factual status of the information supplied in the premises” but does not specify further.

It is important to keep considerations of factual knowledge and familiarity with material distinct, although of course they are related. With familiar materials subjects are simply likely to know more and so factual status of the premise or conclusion becomes a potentially salient consideration for the subject. In contrast, with unfamiliar material there is less danger of coming to a valid but known to be false conclusion, which could moderate the interference of own knowledge, but there is clearly also sometimes an independent reluctance to draw any conclusions about exotic material. Increased familiarity leads factuality to be an issue; less familiarity seems itself to be an obstacle to reasoning with the premises.

In my study I found this pattern in unschooled subjects. Consider, for example, the responses of Malinge (group 1) on two items: one about a truly unfamiliar situation, the stones on the moon, the second about a new object in a familiar domain, washing clothes.

**Malinge, group 1:**

E: This one is about the moon. And on the moon all the stone are green.
   A man, he goes to the moon and he finds a stone.
H*: Is he a Shangaan?  

E: OK so this man goes to the moon and he finds a stone there. what colour is that stone?
S: I won’t know.
E: But suppose all the stones on the moon are green. And the man, he finds the stone on the moon. What colour do you think it is?
S: If there are green stones, for sure then the man got a green stone.

---

10 The Shangaan are a southern African tribe – it’s not clear what reason there is for saying this, unless they are purported to have magical powers enabling them to do things like fly to the moon.
E: Suppose there’s a new kind of washing powder. It’s called Cillit Bang, and suppose that if you use this new kind of washing powder you don’t need to use water. And suppose you are going to wash something with this new kind of washing powder. Will you use water?
S: To wash clothes with this powder?
E: Yes.
S: I don’t think there is something you can wash with, without water.
E: So you always have to use water?
S: In my knowledge, it’s like that, you can’t wash clothes without water.

* H = Subject’s husband

So we see unfamiliarity does not always prevent reasoning according to the premises. Indeed, when the premises refer to situations about which the subject could reasonably have no own knowledge, it might seem less odd to rely on what the experimenter says – to take their word for it, so to speak. The subject has only that (linguistic) information as a source for inference. The experimenter is thus unproblematically the provider of the relevant information. In some of Luria’s examples of “unfamiliar situations”, on the other hand, the subjects might have some idea of what happens up north, and of what kinds of bears they are, or infer that the experimenter thinks they do – after all, they are being asked about it. This is exactly what we see happening in the excerpt from Malinge’s transcript. Whose information takes precedence? Moreover, these “unexperienced” conditions are still about their world, and could plausibly be imbued with some political significance or used for political ends (although that’s hard to imagine with the white bears example!). All this would influence how the subject responds to the task: they don’t have the benefit of the tester’s perspective, in which similarity of the test items is apparent. See further discussion of this in the questions and informativity section.

Moreover, there are several ways in which task material can be “not associated with experience”: in some cases it’s an unfamiliar situation being described (white bears in the north of Russia); in other conditions, the unfamiliarity centres on the objects or concepts under discussion. What Luria calls unfamiliar is of the former kind. However, Tulviste (1991) found that subjects with some schooling are inclined to respond to task materials of the latter kind ‘logically’. That is, when asked to draw conclusions about unfamiliar kinds, they draw their conclusions from the given premises, more so than when familiar kinds are referenced. With premises like ‘All precious metals do not rust. Molybdenum is a precious metal. Does molybdenum rust or not?’ school-going children offered “theoretical” bases for their answers which refer only to information given in the premises.

\[11\]Tulviste maintains Scribner’s categorization of responses; theoretic means “the subject draws only on the data contained in the problem and on the logical correctness of the conclusion from the given premises” (Tulviste, p. 120).
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– much more commonly than in conditions where the premises described familiar, everyday situations. Another problematic aspect of the “associated with experience” and “not associated with experience” distinction used by Luria, is that it’s not clear how he sorted his test set into these two classes. He gives an example of each – as mentioned above – but where would “Precious metals do not rust. Gold is a precious metal” fit in? Did his subjects know what gold is or not? Did they know the category ‘precious metals’? If the answers are “yes” and “no” then we have a Tulviste-style unfamiliar condition in which we might expect more logical answers.

Questions and informativity

As we’ve seen above, the epistemic relation of the subject to the test material is an important variable in determining subject response. Comparing the question-answer pairs for the intended interpretation of these tasks with normal question-answer structure is illuminating in this respect. First, let us examine the epistemic structure of an everyday question and answer. Usually, the questioner indicates, by the act of asking, that they themselves do not know the answer to their question. Also, they signal to whoever they address the question, the addressee, that they expect them to know the answer. Consider the example (with polite forms stripped off for convenience):

Q: Which way is the train station?
A: Carry on over the intersection and then take the next right.

This is an unremarkable, if curt, exchange. But now imagine being asked the question by a train conductor (for the railway company operating out of that station). It would be very strange indeed to hear her ask such a question, because we expect her to already know the answer, even if we do too. It would be even stranger if the train conductor asked a more specific question, say:

Q: Which way is the station staff room?12

because here we expect her to know the answer sooner than we, the passing pedestrian, could be expected to. In normal question-answer pairs, thus, there is epistemic asymmetry between questioner and addressee, which motivates the asking of the question in the first place.

This contrasts with the situation in the reasoning tasks as described above. Let us consider a sample question-answer pair – on the intended competence model – in this situation:

Q: In the Far North, where there is snow, all bears are white. Novaya Zemlya is in the Far North and there is always snow there. What colour

12Or, even more distressingly:
Q: Where’s the brake?
are the bears there?
A: White.

Here the questioner has provided information before asking the question, information with which one can in principle answer the question. By giving this foregoing information, the questioner signals that he has the necessary knowledge to answer his own question, and more than this, creates common knowledge of it. Yet he asks the question of the subject. Now the subject is expected to answer on the basis of information given by the questioner. To our school-trained eyes, this might be quite normal. But imagine that you haven’t got the benefit of school-trained eyes which immediately recognise that this is one of those circumscribed contexts in which the epistemic asymmetry doesn’t hold. Then you would find it odd. You might find it as strange as the train conductor asking you the way to the station, after telling you how to get there. Note here that also subjects’ familiarity to the material will play a role here in determining the sense of this.

Where do question-answer pairs which violate epistemic asymmetry occur? Certainly they are a large part of formal schooling, since any kind of test forms such a case. Are they restricted to school contexts? Not necessarily; plausibly any learning situation involves similar questions directed to the learner on the part of the instructor. But in learning a skill, especially a physical one, such questions would be restricted to displays of skill, of know-how, not of knowledge, know-that (even if this is in turn to show know-how in thinking).

About those bears: who knows what colour they are? Who cares? No-one in the situation need really know, or care. We are being asked to display our knowledge, as evidence of our skill in manipulating information. The question is not a question after information as such, but only after information as much as it shows that we have understood the intended coherence of the foregoing premises with the premise. However, if you are interpreting the question as one after information, then you would try and offer your own knowledge of the situation as an answer. Could this be explaining the ‘personal’ interpretation of the premises Luria saw?

Often a subject seems to employ a mixed strategy, using the premises to draw a conclusion but when asked for justification being informative by suggesting justification for the premises themselves and not using them as justification. This was common especially with conditional premises, and specifically subjects often seemed to want to offer justification for the conditional relationship; for instance

Nomhle, group 2:

E: If Ntombi wants to see her friend then she goes to East London. And she does want to see her friend. Will she go to East London?
S: Yes.
E: Why will she go to East London?
S: Is it because she wants to see her friend?
E: Yes, she wants to go.
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S: *Maybe she can talk to her parent and tell her that she wants to go and see her friend. Maybe Ntombi is interested to go and to see her friend but now she doesn’t have enough money. So maybe her parent will give her money to go to East London to see her friend.*

See further discussion of this in the section on conditional premises.

Problems with generality

Luria found that subjects had specific difficulty with “the universal nature of the premises”, which was “in all cases . . . not respected”. In the current study we also found that universal premises proved tricky for subjects, but for a variety of reasons. Why this is so is explored further in the following chapter but here there are several varieties of generalisation which deserve attention.

Problematic generalisations 1: Law-making statements

Certain premises in the syllogistic task materials lend themselves to a deontic reading: for example, “all people who own a house pay house tax”, as used in both the current study, and also in Scribner’s study with the Kpelle (Scribner, 1997, p. 131). So the house tax generalisation was often interpreted as “all people who own a house *should* pay house tax” or “all people who own a house *must* pay house tax”. Indeed, the descriptive generalisation would presumably only hold because of an underlying decree – no-one except the rich and philanthropic would elect to pay house tax. As will be argued in the next chapter, a descriptive and law-like reading of the generalisation would be highly contrived for the subjects of the current study; the same would have held for Luria’s and Scribner’s subjects.

In the following transcript, a high-school student explicitly ties the strict/law-like reading to the deontic reading of the generalisation:

**Thembakazi, group 1:**

E: More school problems. This one says suppose that all lawyers smoke cigarettes. And suppose that all people who smoke cigarettes also drive fast cars. Then, according to this problem, can we say that all lawyers drive fast cars?

S: (repeats problem) No, they don’t all drive fast cars.

E: Why not?

S: Because *it’s not law, people are not forced to drive fast cars.*

E: But just listen to the words, it doesn’t matter if it’s true or not. Suppose it’s happening somewhere else, and suppose that in this place, that all lawyers . . . [premises repeated]

S: Do I have to believe this is happening?

E: Yes, and if you pretend this is true, then can you conclude all lawyers drive fast cars?

S: Yes.
Assuming subjects do go for a deontic reading of the generalisation – as paraphrasing supports – this changes the semantic structure of the task, because, for example, someone not paying house tax violates but does not falsify the law. In some cases, the deontic statement supports the descriptive statement and subjects are happy to use the latter to draw conclusions about individuals; but when the descriptive generalisation is required as a premise to conclude something about a whole group – often leading to an unlikely scenario – then the subject points out the gap between deontic and descriptive statements. This can be understood as a default or generic variant of the descriptive generalisation, i.e. tolerating counterexamples, with the strict law-like reading applying only to the deontic reading – “all people should pay house task and generally people do – but not always”. This explains the following excerpts:

**Nonkululeko, group 2:**

(preamble) All people who own houses pay house tax. Sabelo does not pay house tax. Does he own a house?
S: He doesn’t have a house if he’s not paying.
E: And now suppose that none of the people in Cape Town pay house tax. Do they own houses or not?
S: They have houses.
E: Why?
S: They can have houses because there are places where you don’t pay tax, like the squatter camps.
E: So they can have houses and not pay?
S: They may, they can live at the squatter camps.

**Rosie, group 2:**

E: Suppose that all the people who own houses pay house tax. And suppose Luazi owns a house in Hamburg. Does he pay house tax?
S: He has to pay if he’s got a house.
E: And suppose Sabelo doesn’t pay tax. Does he own a house?
S: He doesn’t have a house, if he’s not paying tax.
E: Now suppose none of the people in Hamburg pay house tax. Does that mean that they own their houses or not?
S: Those who have houses, they will pay tax and those who don’t have houses, they won’t pay tax.
E: So if no-one in Hamburg pays tax, does that mean that no-one owns a house in Hamburg or not?
S: They may have the houses, but they decide not to pay.

Sometimes the deontic is used to justify why a descriptive generalisation would result:

**Nokulula, group 2:**

E: OK. Now suppose that no-one in Hamburg pays house tax. And remember that everyone who has a house does pay house tax. Does that mean that people in Hamburg own houses or not?
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S: If they are supposed to pay and don’t pay, then the houses will be taken anytime, because they are breaking the law. They are not paying, even though they are supposed to pay. So.
E: So they break the law basically?
S: Ja.

As is obvious from the above transcripts, subjects are often taking a deontic reading of the descriptively intended premises of the form “All people pay house tax”. A deontic reading has a different semantic structure to a descriptive interpretation of the generalisation, and, in particular, does not support the required inferences without an additional premise which connects the law to actuality i.e. one which states that everyone actually does obey the law. Precisely the plausibility or justification of this necessary but implicit additional premise is what subjects are concerned with in the above transcripts.

Problematic generalisations 2: Generic statements

Generic statements are characterised by their tolerance of putative counterexamples, which turn out to be mere exceptions to the rule. The statement “chairs have four legs” can be accepted along with the existence three-legged barstools which, strictly, falsify the statement. In fact, it is sometimes surprising how tolerant generics are taken to be, as the following example illustrates.

Headline: ‘Women long for plastic surgery’
Subheader: ‘One in two young women are so dissatisfied with their appearance they would consider plastic surgery, a new poll has revealed’.

(ITV.com news website, Jan 29, 2007)

According to the British ITV’s news website, just half of a set is enough to justify a generic claim!

This issue is relevant because Luria complained that his subjects never maintained the ‘universality’ of the quantified premise but in fact he ignores the possibility of a generic reading of the premise. In fact, many of his subjects’ responses contain a more generic variation of the premises than those originally presented by Luria: “If the land is good, cotton will grow there”, “Each locality has its own animals” (pp. 108–109).

Positing a generic reading for the universal premises weakens the link between that premise and a particular second premise, because it comes to depend on the specificities of the protagonist. The possibilities for the relation between protagonist and the generalisation widen from just exemplification to include also exceptionality. Being asked to justify your conclusion then becomes a request for a justification of the choice between an exemplar and an exception interpretation of the protagonist. Merely mentioning a protagonist is singling them out, in a sense, and we might thus even expect a tendency towards the exception reading.
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In the following two excerpt we see a subject twice switching to an exemplar reading when the justification for an exception reading is ruled out:

**Nokulula, group 2:**

E: Suppose all people who own houses pay house tax. And suppose Luazi owns a house in Hamburg. Will he pay house tax?

S: No, he doesn’t pay.

E: Why?

S: For example, I’ve got a house in Hamburg, and I built the house myself, so I don’t pay house tax.

E: OK. But now suppose there’s a new law, that all people who own houses must pay house tax. Then would you have to pay house tax?

S: Yes, then you pay.

... 

E: Ok. And now suppose I tell you all Xhosa people own cattle. And Peter is some man, we don’t know whether he’s Xhosa or not. But suppose we know that he doesn’t own cattle. Then can he be Xhosa?

S: He can be Xhosa because there are Xhosa who don’t have cattle.

E: But suppose that all Xhosa own cattle.

S: He won’t be Xhosa if all of them have cattle.

**Reassessing Luria and Scribner’s findings**

In the foregoing we have explored aspects of the semantic structure of reasoning tasks with quantified premises with the aim of evaluating whether Luria was right to conclude that unschooled reasoners “are limited to concrete, situational thinking”. Similar to Scribner it was found that less schooled reasoners tended to employ a “mixed strategy”, but it was argued that the seeming ‘mixed’ character of their responses stems from a unified set of semantic concerns, about, amongst other things: the epistemic structure of the task; related to this, the epistemic standpoint of the subject and experimenter relative to the task materials; the relation of the protagonist to the generalisation, and the intended interpretation of the generalisation. In the upcoming chapter, when we compare quantified and conditional formulations of premises, it will become clear that especially this last matter illustrates why unschooled subjects are more justly seen as ‘normal’ language users than as non-logical reasoners.

To sum up, it has become clear that Luria’s neat distinction between schooled and unschooled subjects reflects only a very superficial understanding of the reasoning processes of subjects. Not only were typically ‘unschooled’ responses present also in schooled subjects’ performance in the current study, but, prefiguring terminology from Chapter 4, once we take into account subjects’ processing in reasoning to an interpretation, the responses of unschooled subjects can be seen to be very reasonable and understandable even from our highly literate point of view. In the following we extend the analysis to conditional reasoning tasks.
1.3.2 Conditional reasoning results

Some background: the suppression effect task

The suppression effect task was first reported in Byrne (1989). Subjects are presented with a set of sentences comprising either one or two conditional sentences (‘If she meets her friend she will go to a play’) and a simple sentence (‘She meets her friend’). The second conditional sentence is judged to bear either an “additional” or an “alternative” relation to the first one. For instance, ‘If she has enough money, she will go to a play’ would be labelled “additional” to the first conditional because it suggests an extra requirement to make the consequent clause ‘She will go to a play’ true. Another kind of conditional is labelled “alternative” because the antecedent contains another requirement which is by itself sufficient to make the consequent true. See sample sentences in table 1.4.

<table>
<thead>
<tr>
<th>Premise label</th>
<th>Example premise</th>
</tr>
</thead>
<tbody>
<tr>
<td>simple</td>
<td>If she meets her friend, she will go to a play.</td>
</tr>
<tr>
<td>additional</td>
<td>If she has enough money, she will go to a play.</td>
</tr>
<tr>
<td>alternative</td>
<td>If she meets her family, she will go to a play.</td>
</tr>
</tbody>
</table>

Table 1.4: Labels for the different conditional premises in the suppression task

This set-up provides the three different sets of materials used by Byrne. The first set is of “simple arguments”: one conditional and one simple sentence per test item. The others sets, “alternative” or “additional arguments” have an additional conditional premise, respectively an alternative or additional one. Note that the categorization into “alternative” and “additional” is based not on structural features of the conditional, but on prior (to the task) interpretations. The conditional relationships are just as open to interpretation during the task by the reasoning subjects. The experiment is premised on idea that logic is monotonic – i.e. for instance, an inference drawn in the simple argument condition should also be drawn when new premises are added – even if those specify extra requirements to make the consequent true. The link to monotonicity can only be made, however, by in turn supposing that a logical interpretation of the material treats the conditional premises individually – so that no ‘compound’ conditional premise would be generated. We return to this point in Chapter 4.

The ‘suppression effect’ is the label given to a pattern of responses; namely that the presence of certain types of conditional premises leads to lower elicitation rates for some conclusions, than in the condition where no ‘extra’ premises have been added i.e. the simple argument condition (see above).¹³ So for instance, in

¹³In the context of this set-up, Byrne’s description of her finding as a “suppression effect”
### Table 1.5: Rates of inference in the suppression effect task (from Byrne, 1989)

<table>
<thead>
<tr>
<th>Inference type</th>
<th>single conditional premise</th>
<th>+ alternative premise</th>
<th>+ additional premise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modus Ponens (MP)</td>
<td>96%</td>
<td>96%</td>
<td>38%</td>
</tr>
<tr>
<td>Modus Tollens (MT)</td>
<td>92%</td>
<td>96%</td>
<td>33%</td>
</tr>
<tr>
<td>Denial of the antecedent (DA)</td>
<td>46%</td>
<td>4%</td>
<td>63%</td>
</tr>
<tr>
<td>Affirmation of the consequent (AC)</td>
<td>71%</td>
<td>13%</td>
<td>54%</td>
</tr>
</tbody>
</table>

The group which gets the ‘simple’ arguments, rates of MP are higher (96%) than in the group which gets the ‘additional’ arguments (38%), but the same as the group working with ‘alternative’ arguments (also 96%). A similar pattern can be observed in the MT inferences (92% ↘ 33%). The lower rates of DA and AC inferences are further reduced only in the presence of ‘alternative’ premises: 46% ↘ 4% and 71% ↘ 13% respectively. This pattern of responses is summarised in table 1.5. Clearly it makes no sense to compare percentages with conversations, to measure how ‘typical’ the current subjects are compared to Byrne’s. This is not possible, nor is it the goal of this study.\(^{14}\) Rather, the current study is somewhat self-serving. This stems from her experimental set-up (see ‘Experiment 1’, 1989 p. 66): no subjects are given both the simple and the additional/alternative conditions. Thus, the ‘suppression’ is posited to explain the differences not between two different answers from one subject as material is added, but the differences between subjects presented with either one or two conditionals in the premises of the given arguments (the second premise being either ‘alternative’ or ‘additional’ to the first as described above). This can justly be called “suppression” only if we assume that subjects in the two-conditional case somehow generate, say *modus ponens*, on the basis of the first conditional and are then led to suppress it upon reading the second conditional. This would entail *modus ponens* being somehow automatically generated upon reading the first conditional. This is a possibility. But it might also be the case that subjects read and assimilate all the presented material into a single semantic structure – which does not mimic the grammatical/textual structure – and then draw their conclusions. For instance, they might assimilate both antecedents into one complex conditional with either a conjunctive or a disjunctive antecedent, before making any inferences. Byrne’s results are elicited from a set-up which, without further arguments about discourse processing, do not warrant her suggestively labelling the patterns she observes, as “suppression”. Here the terminology is maintained for ease of comparison with other studies, but the above point should be kept in mind.

\(^{14}\)Byrne’s results are garnered per data item, not per subject, so individual differences are lost. This is not the case in interview situations, where individual subjects’ responses are generally collated. Another difference is that the two conditions (i.e. first presentation of a single conditional premise, then an additional or alternative one) can be investigated in the
tended to contribute to the body of work identifying the range of interpretations given to conditional premises and the relations between them in the suppression effect task. To this end, we can make use of existing work which has been conducted with undergraduate populations, e.g. that by Dieussaert, Schaeken, Schroyen and d’Ydewalle (2000), Lechler (2004) and Stenning and van Lambalgen (2008). These studies used sequential presentation, and/or production or interview (elicitation) techniques and as such are suitable to compare with my interview data.

The suppression effect task is a reasoning task in a similar vein to the much-used syllogistic-type task, but with different premise sentences. The original motivation for studying material presented in this form is the so-called ‘suppression effect’ it elicits in subjects (Byrne 1989). The phenomenon is so named because with the addition of certain types of conditional premises subjects are judged to ‘suppress’ an inference they would have drawn had the extra conditional premise not been added. Byrne analysed this phenomenon as evidence that subjects do not use logical rules in drawing inferences. Regardless of whether or not we agree with Byrne’s analysis, the task, and resulting response pattern she identified, are interesting because they give us insight into how subjects collate information in an intuitively fairly natural discourse and how their inferences adapt as they do so. As far as I am aware, the existing data have been collected only in schooled populations. This analysis is intended to contribute to bridging the gap between schooled subject data and unschooled subject data, by examining 1) how unschooled subjects deal with conditional premises, and 2) to what extent their response in the suppression effect task resembles that of schooled subjects.

But note that we are now in a very different comparative situation than we were in for the syllogistic-type task, because, as mentioned, the task elicits neither ‘correct’ nor uniform responses from schooled subjects. Byrne’s original experiment already shows us that undergraduate subjects’ conclusions depend on the perceived relation between two conditional premises, and further studies, by Dieussaert et al (2000), Lechler (2004) and Stenning and van Lambalgen (2008) have discovered a wide range of responses that subjects give to combined premises. For example, within just the ‘additional’ case for the MP inference, when given the premises ‘if $p$ then $r$; if $q$ then $r$; $p$’ Dieussaert et al’s subjects came to the following conclusions:

- $r$
- $r$ if (also) $q$
- not-$r$ if not-$q$
- both $r$ if $q$ & not-$r$ if not-$q$
- nothing follows
- $r$ and $q$
- other

course of an interaction with a single subject.

\footnote{Other studies (Cummins 1995, Byrne 1999) have shown subjects’ sensitivity to the availability to counterexamples.}
It is thus much more difficult to compare the conditional premise data across groups, because the ‘norm’ for the task\(^\text{16}\) is now split from the schooled response, and this itself has splintered into a much broader range of responses. The implication of this for the upcoming analysis is that we cannot do what was done in the syllogistic case, namely take the posited norm as the yardstick for the schooled response, and thereby derive a comparison of schooled and unschooled on the basis of it. As such, this study is exploratory, rather than comparative:

We first look at the ‘simple’ condition, to discern whether the (unitary) logical form proposed in studies with undergraduates (specifically Stenning & van Lambalgen) can explain the responses garnered here, and whether there are differences between groups in this condition. We then proceed to briefly examine combinations of conditional premises, here primarily with aim of ascertaining what range of responses is apparent, and if so, to what extent it varies by group. Sequential presentation of premises to ensure subjects did both the simple and additional/alternative conditions generated much data on single conditional premises, another reason to pursue this split analysis.

Data from the conditional premise set is analysed in the following, with the following questions in mind:

(8) to what extent are the categories of response identified by Luria and Scribner for the syllogistic-type task evident in conditional reasoning tasks?

(9) do unschooled subjects ratify the same inference patterns as those ratified by schooled subjects in this and other studies?

(10) is the interpretation of the conditional statement assumed by the subject recognisably the same as that assumed by subjects in other studies (e.g. Stenning and van Lambalgen)?

(11) does the interpretation of the conditional vary across materials – e.g.

\(^{16}\) I don’t mean to suggest the ‘norm’, as Byrne intended it i.e. the response suggested by the rather contrived classical logical reading of the conditional premises, is an appropriate normative response to the task. In the syllogistic task, the statistical norm in the schooled group coincided with the posited normative answer. This lends plausibility to the posited normative answer, i.e. that generated with a ‘classical’ reading of the quantifier and the relation between the premises entailed by it, under the assumption that people are in general logical. This is not so in the suppression effect task, where the range of responses given diverges widely from the intended normative answer. More than this, the normative answer only makes sense under implausible assumptions about the structure of the task – such as how the two conditionals combine. In the case of the Wason selection task, the situation is again slightly different, since subjects often seem to gain *insight* into the task when moving from the statistically common response to the posited normative answer.

This is not to say that the posited normative model is the *only* norm available for this task; or the most appropriate one. In the final chapter justification for various readings of the conditional in the context of that task are presented; in Stenning and van Lambalgen (2004) there is extended discussion of the alternative non-monotonic notion of validity represented by closed-world reasoning, and how this relates to choices in the selection task.
1.3. RESULTS AND DISCUSSION

when interpreted as a habitual vs a singly-occurring relation – and if so, does it do so consistently across subjects and/or across groups?

(12) to what kind of discourse do subjects assimilate this kind of material? is there evidence that they reflect on the purpose of the discourse and the ‘naturalness’ of the premises?

A notable preliminary finding in the conditional premise data was the relatively smaller number of ‘Luria-type’ responses (that is, those that have earlier been labelled ‘refusal’ or ‘personal’ interaction with premises) within the unschooled subject group and the relative increase in such responses in the more schooled subjects; this finding immediately adds credence to the earlier suggestion that differences in reasoning behaviour across literacy levels might have been overestimated in earlier work because of the focus on syllogistic-type arguments. What we see here is that the scale of difference between subject groups varies according to task material, and that conditional premises yield less contrasting responses between groups. A possible explanation for this finding is outlined in the next chapter.

The rest of this section is devoted to examining in more detail the findings on the conditional premise set. There were several recurrent phenomena across all subject groups with this material. Many of these have been identified in other studies of interpretations of the suppression effect material with undergraduate subject populations (Stenning and van Lambalgen, Lechler). The extent to which the categories presented here are continuous with those identified in other studies will be discussed as we progress through them. We start with phenomena which at first sight are continuous with those identified by Luria as characteristically illiterate responses, and move onto the more general ‘suppression’ phenomena.

The applicability of Luria’s/Scribner’s classification

As we have seen in the previous section, the characteristics of unschooled reasoning identified by Luria, such as elaborating on the given premises or rejecting them as a basis for the conclusion, can be understood as adequate responses, involving extensive reasoning, once allowance is made for subjects’ interpretative engagement with the premises (again, to anticipate, we can make use here of Stenning and van Lambalgen’s terminology ‘reasoning to an interpretation’). Here this understanding of subject behaviour can be extended in analysing reasoning with conditional premises. So although a start is made with the terminology used by Luria, this is only to facilitate a suitable replacement with semantically-derived descriptions. These are not only more accurate but also show how the findings here connect up with those from studies with undergraduate populations.
“Refusal to answer”

There were only two occasions in the conditional premise interviews where subjects seem to interpret the premises only relative to their own knowledge. In both cases it was the first item in the interview. On being asked whether Ntombi would go to East London, Susan replied:

Susan (group 1):

S: How will I know? I don’t know.

This first assertion is quickly overridden and the subject gives an answer (albeit not the expected one – but this is something we’ll discuss elsewhere). Another subject gives a similar initial response:

Vulelwa, group 1:

S: I don’t even know this Ayanda, and I don’t know if she will go to East London. Does she live in Hamburg, this Ayanda?

I avoid the question by suggesting Ayanda lives in Bodium and the subject proceeds to give positive answers. The refusal to answer for lack of knowledge of the characters/situation described, is thus, as it appears in these cases, a relatively easily discarded interpretative set, and the basis for it might be construal of the task as a genuine query for information, something which appears to be more generally the case. When this is ruled out (‘we are not referring to a specific person here’) the subject proceeds to answer. In the first example, it looks as if Susan takes the question to be a more general query about sensible behaviour.

Vulelwa elsewhere:

E: Now suppose there are no cows in England. And there is a place in England called Fawley. Will there be cows there?
S: I don’t know.
E: But what if I tell you there are no cows in the whole of England, and Fawley is in England. Will there be cows there?
S: This question is so difficult.
E: OK. I’ll repeat it. In England, and the whole of England is an island, there’s no cows. Now there’s a small town on the island, called Fawley. Will there be cows there?
S: No, there’s no cows there.
E: Why?
S: Because you say it’s a small town and there’s no grazing fields there.

‘Personal’ interpretation or natural interpretation?

In Luria’s study, unschooled subjects were judged to reason badly because they interpreted the premises ‘personally’, expanding or adjusting them to fit their own knowledge, or more general knowledge (“If the land is good, cotton will grow there.”). Is this really an idiosyncratically unschooled response, and, more importantly, is it a sign of inability to reason with the premises? It seems more likely, from what we’ve seen
in the syllogistic task data, that subjects, especially unschooled ones, are inclined to search not so much for a ‘personal’ but for a ‘natural’ or common-sense interpretation of the premises, assimilating them to everyday discourse form, while schooled subjects access the intended interpretation by suspending the natural one. (At this point, I used ‘natural’ in an intuitive way, but the next chapter is exactly aimed at pinpointing a precise sense in which the discourses are more or less natural.) If this is indeed the case, then one might expect that in premise sets which resemble naturally occurring discourses this effect is reduced, because both schooled and unschooled subjects would use the readily available naturalistic interpretation.

How can this idea be made more exact in the context of the suppression effect data? Use can be made here of the research done by Stenning and van Lambalgen (2008) who have proposed that natural language conditionals hide an ‘abnormality’ clause, that is, a sentence of the form ‘if $A$ then $B$’ is of the logical form

$$\text{(13)} \quad \text{If } A, \text{ and nothing abnormal is the case, then } B,$$

“where what is abnormal is provided by the context” (p. 163). Stenning & van Lambalgen (2008) demonstrates how attributing this form can explain many of the suppression effect phenomena. The conditional premises used in the current study lend themselves to such an interpretation, especially if the ‘abnormality’ clause is understood contrariwise as a marker of ‘normality’. So, for example, “If Ntombi wants to see her boyfriend then she goes to East London” is certainly best understood in everyday conversation as expressing a more generic habitual relationship, which tolerates exceptions, and thus is adequately expanded by “If Ntombi wants to see her boyfriend and nothing else is going on, then she goes to East London.”

There is much evidence that subjects employed this abnormality-sensitive reading of the conditional. Firstly, in several cases the subject gave back a modified form of the conditional, in which it was explicitly marked by the introduction of a marker of (weak) habituality (‘sometimes’ – Thaboliwo and Florence, group 2, Zoleka, group 3);

**Thaboliwo, group 2:**

E: If she has to fetch water she goes down to the river. and she has to fetch water. Where will you look for her? Where do you think she is?

S: *Sometimes*, she has to go to the river to fetch water. . . .

**Florence, group 2:**

E: One more story, about my friend Simon. Imagine I’m looking for Simon. I know that if Simon has homework to do then he will study late in the library. And I know that he has homework to do. Do you think he will be at the library?

S: I don’t know, because you don’t know for sure he’s got homework, you haven’t seen his homework.

E: Suppose I tell you that I know he’s got homework.

\[^{17}\text{Note that a ‘generic’ reading of many of the syllogistic task premises is possible too: “All bears in the north are white” read as “In general, bears in the north are white”.}\]
S: He might be at the library because *that’s what he usually does*, but
*we can’t be sure.*

But secondly, and more vividly, direct evidence is provided by subjects’ enquiries about relevant factors which would prevent the deployment of the conditional relationship, as well suggestions to how these may be overcome. This can be understood in terms of the logical form given above as concern for relevant abnormalities. Often the subject spontaneously mentioned factors which could serve as abnormalities, and which would thus prevent the consequent being fulfilled.

Sensitivity to abnormalities is not always the most accurate way to describe other ways in which subjects qualify the conditional relationship. Many of my subjects were concerned with qualifications to the conditional which were more like (necessary) preconditions than abnormalities. In fact, there is an alternative form which does treat qualifications as preconditions in Politzer (2004). Politzer argues that a range of results from conditional reasoning research can be explained with a single form for the conditional, as proposed by Mackie (1974) for causal conditionals:

\[ [(A & A_1 & A_2 \ldots) \lor (B & B_1 & B_2 \ldots) \lor \ldots] \rightarrow C \]

where \( A \) is the antecedent currently under consideration; \( B \) would be an alternative antecedent which in appropriate contexts justifies the assertion of *if \( B \) then \( C \)* in some cases relevant preconditions were spontaneously offered, sometimes before the *modus ponens* inference was granted. (This will come into play in explaining the suppression effect data.) Since in many cases the \( B \)'s would be null, Politzer concentrates on the abridged form:

\[ (A & A_1 & A_2 \ldots) \rightarrow C. \]

The key aspect of this form is the role of the \( A_n \)'s, which are “separately necessary with respect to \( C \)” and combine to form the sufficient condition \((A & A_1 & A_2 \ldots)\). The \( A_n \)'s are what Politzer calls *complementary necessary conditions* or CNCs. The CNCs enter into a reasoning process because

in asserting the conditional *if \( A \) then \( C \)*, the speaker assumes that the necessity status of the conditions \( A_1, A_2 \ldots \) is part of the cognitive environment, and most importantly that the speaker has no reason to believe that these conditions are not satisfied.

But crucially, in some cases the satisfaction of the CNC-clause is brought into doubt – typically when one has “high availability”, presumably in terms of salience or, as shown in work by Cummins (Cummins et al 1991, Cummins, 1995), when there are many of these CNCs available (‘disabling conditions’ in Cummins’ terms). This form of the conditional can also certainly be fruitfully applied to
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suppression effect data, as Stenning and van Lambalgen did with their version. Here the two versions are treated as of a piece, since a positive precondition \( A \) can be captured by the implication ‘not-\( A \rightarrow ab \)’, where \( ab \) formalises “something abnormal is the case”.

Sometimes the subject first denies the conclusion and gives an additional requirement (or CNC if you like) as justification. Overwhelmingly, when this requirement is met the subject is happy to draw the inference. In the following excerpt, the subject infers the consequent but when asked for justification, she is more hesitant, asking first if the antecedent condition is the reason, and then anticipating obstacles to the conditional relationship obtaining, such as strict parents or not enough money, and suggesting ways in which these can be overcome so that the conditionality of the situation is adequately captured by the premise as stated. She is not so much concerned with abnormalities as preconditions.

**Nomhle, group 2:**

E: If Ntombi wants to see her friend then she goes to East London. And she does want to see her friend. Will she go to East London?
S: Yes.
E: Why will she go to East London?
S: Is it because she wants to see her friend?
E: Yes, she wants to go.
S: Maybe she can talk to her parent and tell her that she wants to go and see her friend. Maybe Ntombi is interested to go and to see her friend but now she doesn’t have enough money. So maybe her parent will give her money to go to East London to see her friend.

This subject’s responses were consistently of this form. Other examples, from all groups:

**Nothabile, group 1:**

E: OK next one. . . . it’s about a young man called Simon. He lives in a town near East London. Now suppose you want to know what Simon is doing today. You know sometimes he goes to East London.
S: He goes to East London if he wants something.
E: Yes, like if he wants to visit his sister then he goes to East London. So today he wants to visit his sister, do you think he will go to East London?
S: *He will make a phone call first to make sure if she’s available.*
E: And if he calls and she’s available?
S: *And if she’s available, and she’s his sister, and he’s missing her,* then he’ll go to East London.

**Vulelwa, group 1:**

(preamble) If Maria finds a job, then she will hire a maid. And she does find a job.
E: Will she hire a maid?
S: She may hire someone or she may not.
E: Why? Why would she hire one or why won’t she hire one?
S: Sometimes it will be difficult for her to hire someone after she has just found a job, immediately hiring someone, because she won’t have enough money, because she’s just got a job.

Another example, in which the subject suggests the precondition is the friend’s desire to see Ntombi:

Sebenza, group 3:
(preamble) If Ntombi wants to see her friend then she goes to East London. And she does want to see her friend.
E: Do you think she’ll go to East London?
S: I think she can phone the friend if she wants to see her.
E: So she won’t go to East London?
S: She’ll phone, and hear from her, the friend, if she can go.
E: And if she’s arranged it with the friend and it’s ok?
S: If they arrange all this then she can go.

Other subjects – group 1 mostly – first gave an answer which belied extra conditions and afterwards checked whether these were met.

Nomvumisa, group 1:
(preamble) Ntombi wants to see her friend. If she wants to see her friend, then she goes to East London.
E: Will she go to East London, do you think?
S: When she wants to see her friend?
T: Yes.
S: No, she can’t go to East London.
E: Why?
S: If she’s here and the other person is in East London, does she have the right to go to East London?
T: Yes, that’s no problem.
S: Well, if there’s no problem then if she really wants to see her friend then she will go to East London.

This kind of response can be seen as fitting Luria and Scribner’s diagnoses that the subject ‘goes beyond the information given’ in the premises, but again, it is not a peculiarly illiterate phenomenon, as my data illustrate, and more generally it is absolutely in line with the findings of for instance, Byrne 1999 and Cummins et al 1991, where schooled subjects’ willingness to draw a conclusion has been shown to depend on the availability of disabling conditions, or in Stenning and van Lambalgen’s terms, relevant abnormalities/preconditions. Concern for both abnormalities and preconditions is certainly influenced by task construal: offering possible counterexamples or necessary preconditions is very informative, under the assumption that the task is about establishing conditions for drawing the inference. See also the section on informativity for more discussion on this issue.
Ignoring premises or taking time into account?

Nonkululeko, group 2:

(preamble) Patricia is looking for her friend Susan. She knows that if Susan has an essay to write she works at school.
E: Where do you think Patricia will look for Susan?
S: She will look for her at home.
E: Why?
S: She will look for her at home because that's where she stays.
E: But suppose we know that she has homework to do, and if she has homework then she goes to school.
S: The first place she will go to is her home, and then afterwards she can go to the school if she's not at home.

This is a typical example of what Luria would have called rejecting or ignoring (before elaborating on) the given premises. But notice that the conditional relationship described in the premise “If Susan has an essay to write, then she goes to school” has a temporally bound character: it might be more fully expressed as “If Susan has an essay to write, then she goes to school at some point before the deadline to work on it”. We don’t expect her to be at school continuously until the essay is finished; in fact, she is probably at school for a relatively short amount of time during this essay-writing period. She could still be expected to spend the majority of her time at home, for instance. With this background, i.e. taking the ‘base-rate’ of time spent at home into account, looking first for Susan at home first is a better strategy than immediately going to the school. Another subject goes further in elucidating this:

Nomhle, group 2:

E: Where do you think Patricia will look for Susan?
S: She will look for her at her home. If she’s not there she will look in the library.
E: Why won’t she look in the library straight away?
S: To make sure she’s already gone, to the library. That’s why she’ll go first to the home.
...The reason why she has to go first to the home, is that maybe Susan, this girl, maybe her parent, her mother, has asked her to do something first, before she goes to the library.

Why would a subject take this ‘base-rate’ into account? One reason would be if you aim is to give an optimal strategy for finding Susan. If you understood the purpose of the task to be to describe the best way to find Susan, and not to demonstrate your grasp of the logical structure of the premises, then a good answer should take the base-rate into account. This ‘search strategy’ reading of the question is also apparent when subjects were faced with an additional condition which might not be fulfilled, leading to a dead-end for the search viz:

Vulelwa, group 1:
E: And now suppose that if the library is open then Susan is working in the library. What do you think now? Do you still think she will be there?
S: She will go there.
E: And what if the library isn’t open?
S: I got a problem now, if the library’s closed.

The temporally-bound nature of conditional premises played a role in the responses of many subjects, especially when the question was phrased in this ‘looking for $x$’ fashion. For instance, with the premises “If Thembi has to fetch water then she goes down to the river. She has to fetch water. Where will you look for her?“:

**Sweetness, group 2:**
S: If at home they said she’s not there, I’ll go to the river.

In the next excerpt the intermittent fulfilment of the conditional relationship is mentioned explicitly:

**Thaboliwo, group 2:**
E: Where will you look for her? Where do you think she is?
S: Sometimes, she has to go to the river to fetch water. Thembi sometimes goes to the river, maybe in the afternoon or the morning. When I see her going to the river, maybe in the morning, I’ll go to her then and see her.

Is this typically unschooled behaviour? Absolutely not. It depends on task construal, and this varies also within schooled subjects. Lechler (p. 60) gives excerpts from undergraduate subjects’ responses which show the same considerations about temporal ranges – and also note in the second to last turn the mentioning of ‘an infinite number of possibilities’ which could prevent the consequent from holding – again evidence that the subject is concerned with abnormalities/preconditions not mentioned in the premises. In this case note the two conditional premises were attributed to different sources in this condition, and the subject is also told the protagonist ‘was quite often in the gym’):

(preamble) If she has an essay to write, she will be in the library. If the library stays open, she will be in the library. She has to hand in an essay next week.

**Subject 6:**
E: So, where would you look for her?
S: Um it is a good chance of finding her in the library. Maybe she could be by the gym as well.
E: Okay, so what could prevent her from being in the library?
S: Well, she could be in the pub, you know. (laughing). There’s a whole, an infinite number of possiblities.
E: So is there any information you would need to decide where she is?
1.3. RESULTS AND DISCUSSION

S: Well, it’d be interesting to know how conscientious a student she was. You know, if she doesn’t give her … Say she is a first year student, and she’s got a week for an essay deadline. She is probably not gonna be in the library. But if she is a final year student and she wants to stay on for a PhD, she will probably stay in the library, working really hard.

Lechler (p. 102) sums up her finding as “Some subjects treat the presented statements in a similar way to everyday discourse, others regard them as some kind of logical task.” In my data, Abongile, a high-school student, illustrates the former reading, where the conditional is understood to be temporally limited:

**Abongile, group 3:**

(preamble) If Thembi has to fetch water, then she goes down to the river. And you know she has to fetch water. So this is what we know: [Repeat premises.]

E: Do you think she’s at the river?

S: (quiet)

E: repeats premises.

S: No.

E: She’s not at the river?

S: No.

E: Why not?

S: She’ll fetch the water and go home.

E: So she will go to the river and then come back?

S: Ja for sure she’ll go to the river and then go home.

This contrasts with Mzikazi, also a schooled subject, who does treat the conditional atemporally, although note that ‘being at home’ is still apparently the default location, and can be understood as a switch to a temporal reading:

**Mzikazi, group 3:**

E: Where do you think Patricia will look for Susan?

S: In the library.

E: And what if I also tell you that if the library is open, then Susan is in the library, do you still think that Susan is in the library?

S: Yes.

E: And what if the library is not open?

S: She’s at home.

The subject’s assumption that the additional condition, such as ‘library open’, holds, was a recurring feature of her treatment of additional premises. It might be the case that an ‘atemporal’ reading of this kind of conditional is a literate default in this context – not necessarily a general tendency, associated perhaps with treatment of the task as ‘some kind of logical task’, but clearly it is not always triggered by material in which a temporally-bound reading is more natural.
CHAPTER 1. LOGIC, LANGUAGE AND KHAMRAK

One last excerpt provides a nice illustration of how a subject juggles with these possibilities – and note that the subject has never been to school. This excerpt is from Susan, whose responses have cropped up elsewhere, because of their close resemblance to those of Luria’s subjects. When the translator intervenes, to suggest Vuyo is really a hypothetical character, it seems that Susan switches from giving advice to the ‘logical task’.

Susan, group 1:

(preamble) If Vuyo has to look after the baby, then he stays at home.

E: And what if we know that Vuyo has to look after the baby today?
S: You’re asking me what I would say? I would search for him, tell him to look after the baby.
T: You haven’t met the person, you just have him in your mind. You haven’t seen him. So would you know he’s at home or not?
S: If I knew he had to look after the baby then I would know that he’s at home.

Justification of the conditional itself

As a final example of interpretational mismatch between experimenter and subject, we look at the phenomenon whereby, on being asked to draw the modus ponens inference, several subjects gave an answer which included a justification of the antecedent of the conditional on which the inference is based. This is a very interesting response. As far as I know, it has not been reported in the undergraduate subject groups. In my data I had one incidence of such a response among the most schooled group:

Thembakazi, group 3:

(preamble) Thembi’s mother is concerned about her. But she believes that: If a student works hard then they will pass. And if a student is clever then they will pass. And the teacher says that Thembi is clever.
E: Do you think the mother will think Thembi will pass?
S: Yes, the mother will think that Thembi will pass, because the mother has gone to the teacher and asked the teacher, and the teacher has told her she’s smart, maybe she has seen her books.

A similar response comes from an unschooled subject, when presented with the same premises, who defends the (amended) conditional ‘If the teacher says a student is clever, then the student is clever, (and thus they will pass)’, but does not phrase it in terms of the mother’s beliefs:

Maggie, group 1:

E: Then what do you think the mother will think – will Thembi pass her exams or not?
1.4 Summary, conclusions and outlook

In some instances the subject’s response seems to indicate a justification of why they themselves are inclined to accept the conditional:

Rosie, group 2:
E: If she finds a job, then she will hire a maid. And she does find a job. Do you think she hires a maid?
S: Yes, she’s supposed to find a maid because she won’t have someone to look after the kids.

An example of how this has been treated in earlier work is to be found in Cole et al (1971): the response from a group of village elders to the problem “Everybody who has a house must pay house tax. I have a house. Therefore, I must pay house tax” was unanimous agreement that the last statement was true “because it had been decreed by the government that we have house tax.” Cole et al call this “extraneous information”; I would rather call it “justification for accepting the major premise”. If the purpose of the task is not clear to the participants they might well see this as a sensible response.

Offering justification for the premises are a counterpart to offering additional necessary conditions for its fulfilment: both responses answer the question “What further information would make this a reasonable inference to draw?” Luria and Scribner might have called these responses ‘empirical bias’; but they are as above more accurately described as specifying grounds for the premise itself, a strategy which could be understood as resulting from concerns to be informative beyond demonstrating one’s own cognition and therefore have to do with general task construal.

1.4 Summary, conclusions and outlook

In the current chapter, earlier experimental work with illiterate subjects employing syllogistic-type materials (Luria, 1976, Scribner, 1997) was replicated. The inclusion of suppression-effect task materials provided an extension of this earlier work. The results from the experiment showed remarkably similar responses to those identified by Luria as typically illiterate, albeit on a lesser scale. The conditional premises derived from suppression-effect materials provoked a more similar response between the schooled and unschooled subjects.

At this point it is worthwhile to reflect on the value of the foregoing analysis. The results of Luria’s experiments often evoke one of two reactions. In Tulviste’s phrasing (1991, p. 118):

Some see in them evidence for the underdevelopment of thinking in people from traditional cultures, their low mental abilities. Others
reject these results, maintaining that the methodology of the experi-
ment is evidently not suitable for use in traditional cultures, that the
subjects do not understand what is expected of them, etc.

One can certainly maintain that syllogistic problems are not suitable for use
in the study of reasoning in illiterate subjects. The problems are strange to the
subjects. Yet, as Tulviste rightly points out (p. 118),

All investigators evidently sensed this inadequacy even before doing
the experiments, for they used the most simple syllogistic problems,
and not problems of the type “Some academics are parents. All par-
ents are drivers. What conclusion can you reach?” (used by Johnson-
Laird, 1983). But as we have seen, even these simple problems are not
“simple” for the unschooled subject. It seems to us that it is exactly
this inadequacy that is of primary interest.

In this chapter our primary interest has indeed been in uncovering some of
the interpretational parameters which cause these seemingly simple problems to
generate the range of ‘wrong’ responses Luria and Scribner both observed in their
data. I argued that once we have more insight into the range of task interpreta-
tions available to a subject we see that their responses are well-argued and not
lacking logic as Luria would have had.

In particular, in analysing the syllogistic task data it became clear that a
logical answer does not preclude reliance on previous experience, and vice versa;
we also saw that the reasoning task has a pathological epistemic structure; and
that generalised premises can be read as generic or law-making statements, thus
changing their relation to a particular premise.

Moreover, when subjects interacted with conditional premises such as those
used in the suppression effect task, their interpretational tendencies aligned with
those found in studies with literate subjects by both Stenning and van Lambalgen
(2008) and Politzer (2004). Subjects can be seen to be employing a common
interpretation of the conditional, which has been identified in other studies as, as
including an abnormality clause. Many of their ‘personal’ responses make sense
as reference to relevant abnormalities, again, something which has been shown to
be more general behaviour in studies in other subject groups (Cummins, 1995).
Also the temporally-bound nature of natural language conditionals features in
the responses of both schooled and unschooled subjects. These factors, along
with some allowance for the occasional caprice of a mystified interviewee, strongly
undermine Luria’s conclusions that subjects rejected or ignored the given premises
or their logical structure.

The analysis thus provides corroborating evidence to the central claim, namely
that illiterate and literate reasoning performance, for all its differences, should
be seen as stemming from a common base of semantic concern. That is to say,
all subjects must first interpret the given premises before they reason with them.
Differences in logical reasoning ability can only be claimed once the differences arising at the interpretational stage have been accounted for. As we have seen, this is not yet the case, and, as such, we have no grounds to claim that literacy brings increased logicality. In the following chapters this claim will be both strengthened and qualified.

Seeing the commonalities in reasoning behaviour across the subject groups brings the illiterate reasoning data back into the arena of interest for reasoning researchers. At the very least it should inspire us to look beyond the university for subjects, to seek out the full range of interpretational parameters which inform reasoning behaviour.