Behavior under Conditions of Uncertainty: Empirical Probes of Subjective Probability

Robert M. Lipgar, Ph.D.
University of Chicago Medical Center

Abstract: A particular pattern of responses is produced when adults are required to make a series of choices between two possible outcomes without benefit of feedback or other information upon which to estimate probabilities of a particular outcome. The predictability of such patterning affirms that guessing behavior is organized by subjectively held "beliefs" about random events — a "subjective probability notion." The study replicated previous findings of a typical or "normal" pattern of guessing behaviors for adults (Lawlor 1956). Further, a Q study of subjective probability notions revealed four factors. Behaviors of representatives and non-representatives of these four factors were examined under three other conditions of uncertainty: coin-toss guessing patterns, narrative responses to Thematic Apperception Test (TAT) pictures, and verbalized perceptions in response to Rorschach's inkblots. Consistent response patterns for representatives of two factors, "normal" and "atypical," were found across conditions of uncertainty, suggesting that subjective probability notions are indicators of underlying core personality constructs. Consistent response patterns associated with the two other factors were less clearly manifest, suggesting that these two Q factors represent "reaction types," rather than established subjective probability notions. The results overall demonstrate that psychological dispositions, "personality variables," or "subjectively-held organizational orientations" (Brunswik 1939) can be studied scientifically and found to be lawful determinants of human behavior.

Introduction

B. F. Skinner has been criticized, along with behaviorism in general, as advocating a deterministic psychology, in which humans are reduced to objects without freedom of choice (Rogers 1964; Rogers in Kirschenbaum and Henderson 1989, 124, 264). Skinner has also been criticized as being anti-theoretical, as though his approach limits psychologists to think of the organism as an empty "black box" between stimulus and response (Reese 1986, 72). However, Skinner's approach to psychology and its implications are much more complex than has been generally understood. Rejecting his behaviorism as either deterministic or anti-theoretical is, I believe, simplistic and mistaken. Skinner's commitment to making the most of scientific method

Author's Address: 743 Lucas Avenue, Hurley, NY 12443; rlipgar@yoda.bsd.uchicago.edu.

Operant Subjectivity 2002 (April/July), 25 (3/4): 164-176.

to increase our capacity to control behavior, hence to choose, need not be taken as a refutation of human freedoms and the need to take responsibility for our choices. To believe that human behavior is lawfully determined and to be committed to seeking determinants of behavior is not the same, in my mind, as foreclosing on human freedoms and choice.

"Radical behaviorism" is distinguished by its preference for pursuing scientific knowledge through experimental analyses of relationships between dependent and independent variables, in which dependent variables are stated in terms of response rates and independent variables are objectively defined stimulus conditions — particular settings, circumstances, or contexts (Michael 1985, 110-4). It is Skinner's insistence on studying behaviors directly, rather than his alleged opposition to theory that better characterizes his contributions. As Skinner's work developed, perhaps in some measure in response to critiques by Carl Rogers and others (Bjork 1993), he showed how radical behaviorism could approach the study of "subjectivity" and examine some of what goes on inside the "black box" (Midgley and Morris 2002).

The study reported here is not an experimental analysis of differences in response rates. It does, however, have at least one feature in common with Skinner's approach, that is, the quantification and comparison of behavioral responses recorded under specific and objective stimulus conditions. This study, employing Q-methodology, is an analysis of behavior and was designed to demonstrate the effects of subjective psychological variables on behavior and to explore the association of subjective probability notions to broader personality variables. Although the methodological choice here is not the kind typically associated with radical behaviorism (See Dews 1970.), Q methodology provides quantified behavioral results, which, in the present study, were objectively compared with analyses of behavior obtained via other procedures.

Associated Academic Perspectives

In studies of learning involving partial or intermittent reinforcement, and in areas of psychological research such as decision-making, risk-taking, and test taking, participant behavior is in part a response to uncertainty (Wright and Ayton 1994). The present study was designed to add to our understanding of how people cope with uncertainty, and to replicate findings reported in different areas of psychology (Yacorzynski 1941; Piaget 1948; Lawlor 1956; Gratch 1959). Theoretical considerations stemming primarily from Tolman and Brunswik (1935), Brunswik (1939), and Piaget (1948) also provide bases for assuming that different subjective probability notions exist, are influential in behavior, and may be scientifically studied. Their classification might lead to further meaningful research. "Subjective probability notions" refer to privately held beliefs about randomness and how sequences of random events

will occur and, in this study, were manifest in personal patterns of predictions (guesses or estimates), for example, the likelihood that the next toss of a coin will come up "heads" or come up "tails."

The Practitioner's Perspective

The task for the practicing psychologist as counselor, psychotherapist, or clinical diagnostician is to understand the individual, one person at a time — to illuminate, interpret, and, often, predict individual behavior based on samples of the person's feelings, thinking, and verbal and non-verbal responses. In practice, the psychologist forms working hypotheses that amount to behavioral predictions about a particular person in a particular social context. In all this work, it seems to me that the practice of psychology rests on theories about perceptual habits, internalized (subjective) notions, desires, fantasies, feelings, thoughts, concepts, and/or "self-concepts" — that is, *personality variables* and *dynamics*. Further, these variables and dynamics are especially influential in organizing human behavior under conditions of uncertainty, that is, when other determinants are absent or inactive, or when we must act without sufficient information to make rational choices.

Uncertainty can be said to be distinctive to the human condition at its existential core. This study, designed to measure and compare behaviors evoked under different conditions of uncertainty, rests on the belief that scientific inquiry will reveal organizing subjective constructs of which subjective probability notions are one manifestation.

Such a demonstration would provide support for the clinician's working hypothesis that subjective factors are operative in organizing human behavior and for the belief that a comprehensive psychology must extend our understanding of such variables. The present study employs empirical methods of analysis different from, and independent of, clinical methods.[1]

Stephenson's 1953 Q-methodology provides us with a powerful way to study subjectivity scientifically, to study Q-sorting as operant behavior and discover "factors" (empirical and quantified representations of subjective constructs). In the report that follows, my assumption is that, when examined under different conditions of uncertainty, the behavior of "high loaders" (sorters who define factors) on different factors will be structurally consistent across different conditions of uncertainty, and that patterns of behavior characteristic of one factor will be different from the patterns of non-loaders and different from patterns of high loaders on the other factors. Such findings would considerably augment Lawlor's 1956 demonstration of "subjective probability," and would provide further evidence in support of the hypothesis

[1] Clinical methods are also empirical and can be conducted in systematic ways congruent with the canons of science (See Edelson, 1984; 1988).

that subjective constructs are lawfully involved in the way human behavior is organized.

Method[2]

Participants and Data Collection Procedures

Thirty participants were selected for this study, including persons at different levels of mental functioning (10 "normals," 12 patients with diagnoses of psychosis, and 8 non-psychotic patients). Other psychosocial characteristics, such as religion, education level, occupation, major personality defenses, and prominent symptoms were considered to be more or less randomized.

Four kinds of behavior were recorded for analysis: 1) guesses in a no-feedback coin-tossing situation in which participants were required to write down their guesses as a series of 16 H's for "heads" and T's for "tails";[3] 2) sorts of 72 Q-items selected from a concourse of patterns of 16 H's and T's (Appendix 1, Table 1); 3) thematic responses to *structured* but *ambiguous* stimuli (pictures of people, alone or with others in various situations, from the Thematic Apperception Test); and 4) verbally reported percepts (i.e., "what does it look like") in response to *unstructured* and *ambiguous* stimuli (the inkblots of the Rorschach "test").

Anticipating that the patterns of guesses could be classified and that a factor analysis of the Q-matrix would yield several factors, responses to pictures selected from the set of drawings composing the Thematic Apperception Test (TAT) and to the inkblot images comprising the Rorschach "test" were collected so that the responses of factor-types could be studied in depth. Responses under these other conditions of uncertainty provide further empirical bases for interpreting the Q factors.

Data Analyses

The correlation matrix of Q sorts was factor analyzed and a varimax solution was obtained yielding four factors. The resulting factor-arrays were compared with patterns of 16 guesses of H's and T's produced by the factor representatives (the highest loaders on each factor) to determine the congruence between these guessing patterns and the items ranked highest in the factor-arrays.

The stories given in response to the TAT pictures by the factor representatives were reviewed and compared with those written by other

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[2] For details of data and analyses see Lipgar 1965.

[3] The participants were asked to guess the toss of a coin prior to sorting the Q-cards so that they would have had recent practice making guesses of "heads" and "tails," recording their guesses as a series of H's and T's. Participants were asked, "to make as many correct guesses as you can." Each participant was studied separately; a coin was tossed 16 times and after each toss participants marked down an "H" or "T," creating their own sequences of 16 H's and T's. Following this, the task of sorting the Q-cards comprised of patterns of H's and T's did not seem so odd a task.

participants in order to discover whether there were systematic differences in the length, content, structure, relational dynamics or themes, or other aspects of the stories. This kind of "clinical" analysis revealed differences in the way in which *time* was treated; this was most evident in stories given in response to TAT Card #1 (the boy with a violin). (See Appendix 2.) In order to establish that these differences were not solely the private insights of the investigator, a "Treatment of Time" rating scheme was devised and four clinicians were asked to rate independently how *time* was treated in the stories of 20 of the participants (Lipgar 1969). TAT stories by subjects who best represented each of the factors in this study were analyzed, and a typology of ways of organizing time was derived. Four clinical judges applied the criteria to stories written by representatives and non-representatives of the four factors.

The Rorschach tests were administered and scored as prescribed by S. Beck et al (1961). Participants were presented with ten inkblots printed on cards, and asked to look at the inkblots and tell what each one looked like to them. These "percepts" were recorded as the participant responded, and after responses to all ten cards had been given, an "inquiry" was conducted in which the participants were asked to say what it was about the inkblot that made it look like the "bat," "butterfly," "man," etc. These percepts were then scored in terms of good and poor form, how much of the inkblot was used in the percept, what aspects (e.g., shape, shading, and color) of the inkblot were used, and so on. These scores are used to represent the "structure" of the person's approach to the task, for example, whether the percept was formed by using the whole blot or parts of it, in numerical terms; comparison of scores can be made person to person and with norms for various demographic groups. The content of the percepts can also be summarized numerically, for instance, number of animal, human, and inanimate percepts, etc.

Results

Subjective Probability Notions

As noted, a factor analysis of the correlational matrix yielded four factors. After a varimax rotation, the Q-sorts by participants with the highest loadings in each of the four factors were used to obtain a composite rating (factor array) of the items (patterns of H's and T's). Then, on the basis of inspection of items rated high and low, four types of subjective probability notions (S.P.) were described as follows (See Appendix 1, Table 2.):

S.P. Type I (Factor 1). Preference for many runs, short runs, approximately equal proportions of the two equally likely events, and some tendency to avoid sequences with obvious regularities (symmetry of patterning);

S.P. Type II (Factor 2). Preference for one event with no other notable extremes in terms of number of runs, length of runs, or patterning;

S.P. Type III (Factor 3). Unusual attention to patterning without a stable preference for such "popular" features as many runs, short runs, and an equal proportion of the two events;

S.P. Type IV (Factor 4). An avoidance of patterning or symmetry without a stable preference for using the "popular" structural features.

Guessing Behavior

These four Subjective Probability (S.P.) types were next studied in relation to the coin-toss guesses. Guessing patterns produced by the best representatives of the S.P. types were compared with their Q-sort preferences, and contrasted with guessing patterns produced by those participants whose Q-sorts showed no appreciable signs of the particular factor-effects under consideration.

Patterns of guesses for both S.P. types I and II were consistent with the Q-sort factor-arrays. For S.P. types III and IV, however, the relation between these participants' actual guessing sequences and their respective factor arrays was not as consistent and as readily apparent. Even so, the patterns of sequential guesses in a non-feedback situation were distinguishable from each other, classifiable, and tended to be associated with each of the four factor-types.

The Thematic Apperception Test (TAT) Stories

Independent judges' ratings of stories told to card #1 of the TAT confirmed the objectivity of the derived Time-type descriptions, and the hypothesis that these Time-types were associated with S.P. types in independent cases was supported. These ratings independently confirmed systematic differences among the four factor representatives in terms of how time was treated in their stories. These associations can be summarized as follows (See Appendix 2.):

S.P. Type I was associated with orderly management of the time sequence in the thematic material, together with a personally involved participation in the flow of time, appropriate and realistic tensions about the use of time, and an integrated conception of the continuity of time.

S.P. Type II was involved with an avoidance of the future in the thematic material, a sense of frustration and disappointment with time, a sense of impotence in a power-struggle or contest of wills, and an attachment to, or lingering with the past.

S.P. Type III was found to be associated with thematic material in which there was an avoidance of the past together with unrealistic or fanciful, fairytale hopefulness about the future. The future tended to be conceived of as a "place" to arrive at, or to be encompassed by, rather than as a continuation of the present to be planned for.

S.P. Type IV was associated with an emotional detachment from others and a "fabricated" involvement in the present, with a kind of intellectualized puzzlement not found in the other three types, and omnipotent conceits appear overtly or can be inferred.

The Rorschach Inkblot Responses

To consider further the question of whether subjective probability notions were associated with how behavior was organized in another condition of uncertainty, we analyzed response patterns to the ten Rorschach inkblots. Differences in response patterns of percepts scored using Beck's criteria (Beck et al. 1961), were sought and comparisons with the guessing behavior of the four S.P. types were made in two ways with the following results: 1) rank order correlations between participants' ranks according to their loading on each factor and participants' ranks according to their raw score on 19 Rorschach scoring categories showed distinctive kinds of significant correlations for each of the four S.P. types; and 2) an analysis of median values for factor groups in contrast with non-factor groups and also in contrast with a normative comparison group, showed interpretable, different patterns of trends, none of which contradicted each other or the significant correlations obtained by the first procedure. The consistency of these different analyses supports the finding that the four factor types are different from one another and that these differences are identifiable in the Rorschach response patterns.

An Interpretive Synthesis

S.P. Type I

Integrative and reality-appropriate critical abilities are manifest in the Q-sort behavior, guessing behavior, and TAT and Rorschach responses for participants representative of Factor 1. In their relation to reality, these participants can be considered *alert and responsive;* uncertainty for these participants presents a *problem* to be handled by application of some general rules of conduct derived from past experience.

S.P. Type II

Denial, suppressed emotionality, and restricted productivity appear in conjunction with Factor 2. These participants can be described as *disappointed*

in reality. They may be said to experience uncertainty as a *gamble* to be handled by reliance on *luck.*

S.P. Type III

Factor 3, a bi-polar factor, appears to include a *flighty* subtype together with a *rigidity* subtype, both of whom seem distractible and puzzled and react rapidly to new stimuli. These participants relate to reality in a *wishful* way, and uncertainty is a pervasive part of a *puzzle* that, if solved, would eradicate perplexity and uncertainty once and for all.

S.P. Type IV

Looseness of perceptual and intellectual controls, together with some deceit and/or conceit with regard to reality demands, appear to be associated with S.P. Type IV. These participants have a *distrustful* relation to reality, and uncertainty is viewed as the result of a *hoax* or a *trick.*

With regard to clinical diagnoses, there is greater than chance association of Factor I with "normals" and patients with non-psychotic diagnoses, and of Factors III and IV with patients with psychotic diagnoses. Factor II tends to be associated with those few normals in the sample who were under 14 years old and with several non-psychotic patients with depressive features.

Summary and Conclusion

One of the subjective probability notions (represented by Factor I) has the same structural characteristics reported in other studies for normal adult subjects. Research participants holding this subjective probability notion guess in ways consistent with their view or quasi-theory about the structure of sequences of random events, that is, their behavior is congruent with their preference for sequences with short runs, many runs, equal proportions of "heads" and "tails," and ones without obvious pattern regularities.

Three additional subjective probability notions have been identified, and may be considered atypical. Although the guessing behavior produced by participants holding these *atypical* S.P. notions can be distinguished from each other, only one of these three *atypical* types appears to be congruent with the S.P. notion held (represented by Factor II). For the two other S.P. types, represented by Factors III and IV, the association between behavior and belief is not as congruent or coherent, and not easily made clear in operational terms.

It appears, therefore, that one can speak meaningfully of only two subjective probability types, S.P. Types I and II, in the sense that only these two appear to be related to the organization of behavior in other settings of uncertainty. Representatives of Factors III and IV, referred to above as S.P. Types III and IV, are probably better conceptualized as "reaction types." As reactions types, however, they can be identified by means of tasks requiring

participants to employ probabilistic notions. These data do not permit conclusions to be drawn about the full extent of variations in types of subjective probability notions, nor about the frequency in the general population of the ones identified.

Treatment of time and attitudes toward time, as manifested on TAT stories, can be classified as four Time-types derived from grouping research participants according to S.P. types. The Time-types can be independently identified and are associated with the psychological effects of the S.P. types. Also, representatives of different subjective probability notions have been found to be different from each other on the Rorschach.

These links among different kinds of behavior in response to different conditions of uncertainty provide some evidence that the organization of subjective probability notions and guessing behavior is connected to aspects of personality organization, specifically to the treatment of time, and to perceptual control as reflected in the Rorschach. Hence, the central hypothesis for the study was supported: subjective probability notions are found to reflect some core features of personality functioning. These analyses suggest an organizational core common to both domains. This organizational core may be described in terms of variations in combinations and saturations of four dispositions toward reality — reality seen as *a problem*, *a gamble*, *a puzzle,* or *a hoax*.

This use of Q-methodology illustrates how interrelations among behavioral, perceptual, cognitive, and personality variables can be scientifically explored with a small number of subjects. Investigations of this kind can provide objective, systematic empirical bases upon which to build and refine theoretical understandings of psychological functions governing human behavior. In brief, this study sheds light on how people deal with uncertainty, when required to respond with limited or ambiguous information about external reality and with little or no knowledge of consequences. Further, this study shows that identification of Q factor-types can be useful in organizing further empirical probes into the relationship of subjective probability notions and other psychological variables associated with behavior under conditions of uncertainty.

References

Beck, S., Beck, A., Levitt, E.E., and Molish, H.B. 1961. *Rorschach's test.* New York: Grune and Stratton.

Bjork, D.W. 1993. *B. F. Skinner: A life.* New York: Basic Books.

Brunswik, E.J. 1939. Probability as a determiner of rat behavior. *Journal of Experimental Psychology* 25:419-31.

Dews, P.B., ed. 1970. *Festschrift for B. F. Skinner.* New York: Irvington Publishers, Inc.

Edelson, M. 1984. *Hypothesis and evidence in psychoanalysis.* Chicago: University of Chicago Press.

———. 1988. *Psychoanalysis: A theory in crisis.* Chicago: University of Chicago Press.

Gratch, G. 1959. The development of the experience of non-independence of random events in children. *Child Development* 30:217-27.

Kirschenbaum, H. and Henderson, V. 1989. *Carl Rogers: Dialogues.* Boston: Houghton Mifflin Co.

Lawlor, W. 1956. Subjective probability in sequential uncertainty situations. Ph.D. diss., University of Chicago.

Lipgar, R.M. 1965. Subjective probability notions, guessing behavior, and their personality correlates. Ph.D. diss., University of Chicago.

———. 1969. The treatment of time in the TAT. *Journal of Projective Techniques* 33:219-29.

Michael, J.L. 1985. Behavior analysis: A radical perspective. In *Psychology and learning: The master lecture series,* vol. 4, ed. B. L. Hammonds. Washington, DC: American Psychological Association.

Midgley, B.D. and Morris, E.K. 2002. Subjectivity and behaviorism: Skinner, Kantor, and Stephenson. *Operant Subjectivity* 25(3/4):127-38.

Piaget, J. 1948. *The moral judgment of the child.* Glencoe: Free Press.

Reese, E. 1986. Learning about teaching from teaching about learning: Presenting behavioral analysis in an introductory survey course. In *The G. Stanley Hall lecture series,* vol. 6, ed. V.P. Makosky. Washington, DC: American Psychological Association.

Rogers, C.R. 1964. Toward a science of the person. In *Behaviorism and phenomenology: Contrasting bases for modern psychology,* ed. T.W. Wann. Chicago: University of Chicago Press.

Stephenson, W. 1953. *The study of behavior.* Chicago: University of Chicago Press.

Tolman, E.C., and Brunswik, E. 1935. The organism and the causal texture of the environment. *Psychological Review* 42:43-76.

Wright, G. and Ayton, P. 1994. *Subjective probability.* New York: John Wiley & Sons.

Yacorznski, G.K. 1941. Perceptual principles involved in the disintegration of a configuration formed in predicting the occurrence of patterns selected by chance. *Journal of Experimental Psychology* 29:401-6.

Appendix 1

Table 1. Q-sort Item: Example (1 of 72)

T T H T H H H T H H T T T H T H

Distribution of Items in Q-sort

Rating Scale	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
No. of Items	1	2	4	9	12	16	12	9	4	2	1

Instructions to the Participants for Rating the Q-items

"Place the items that look like *"good guesses,"* that look like the penny would come up that way, over here [examiner points to the right of the stack of item-cards now on the table in front of the participant] and the ones that you don't believe are very good or likely, over here [examiner points to the left] and the ones that seem just so-so, or the ones you aren't quite decided about, put in the middle. So you will have three piles to start with."

[After the participant had read through and sorted the 72 item-cards into three piles, the examiner instructed the participant to continue to review and sort the cards into smaller piles until the above distribution had been decided upon by the participant.]

Table 2. Top Ranking Items for Four Subjective Probability Factors

Rank	*Item No*	*Structure of Item**	*Item*
		Factor I	
1	22	8:8, 8, 3, NS	TTHHTHHHTTHTTTHH
2	24	8:8, 9, 3, NS	TTHHHTTHTHTTHHHT
3	48	8:8, 8, 3, S	THTTHHTTHHTTTHHH
		Factor II	
1	54	12:4, 7, 3, NS	TTTHTTTHTTTHHTTT
2	51	12:4, 6, 3, NS	TTTHTTTTTHHTTTTH
		Factor III	
1	31	8:8, 8, 5, S	HTTTTTHTHTHHHHHT
2	7	8:8, 8, 5, NS	HTHHHHHTTHTTTHTT
		Factor IV	
1	22	8:8, 8, 3, NS	TTHHTHHHTTHTTTHH
2	9	8:8, 8, 5, NS	TTHTTHTHHHHHTTTH

* *The structure of the item is notated in terms of proportion of heads and tails, the number of runs, the length of the longest run, and the non-symmetry or symmetry of pattern of guesses.*

Appendix 2

Treatment of Time in TAT Stories Told by Subjective Probability Factor High Loaders

Factor I: Representatives show a personal involvement in a continuity of events clearly placed in three time dimensions. By implication, time is filled and spent.

e.g., Subject # 3 (0.84)

"The parents of the boy have — want him to take music lessons. They bought him a violin. I would think that he is at home waiting for his tutor or instructor. He doesn't want to play the violin. He looks like he is trying to figure what it is all about, why he should. He will be able to play the violin and he may be very good at it but I don't think that would be his career. But I think in later years he may develop a genuine appreciation for good music." *(Note: continuity of past, present and future events and references to feelings and motivations.)*

Factor II: Representatives' stories express themes of resistance and contrariness, involving contests of opposing wills. The future is avoided, and the past events or states are heavily invested and of current concern.

e.g., Subject # 13 (0.64)

"This is a boy. He has a violin and his music sheet is on the table, but it seems like he might be a little disinterested in his lesson, in doing his violin, and he's more or less trying to decide whether he wants to play it or just what he wants to do... *(Examiner: What happened before?)* Seems like he probably has this instrument and he didn't get along with his teacher and was put in this room by himself and he has to think it over... *(Examiner: How will it turn out?)* Seems like he didn't want to go along with his instructor so he was put in this room to decide what he should do... *(Examiner: What will he do?)* I think he should be able to have his own feelings. He should be able to tell his parents and to try something else." *(Note: future not included.)*

Factor III: Representatives' stories tell of people who are perplexed and overwhelmed by present time events or states from which there is flight to a highly invested, make-believe future.

e.g., Subject # 16 (0.69)

"The first thing I thought of was a kid having to take violin lessons. Now that I look at it, he looks like he's daydreaming ahead. He seems like he's serious minded... *(Examiner: What is he dreaming about?)* Someday that he's gonna

be a great violinist. That he can play it good later... *(Examiner: What happens next?)* I imagine that he would be a good violin player. I sort of imagine him with a tuxedo on, playing." *(Note: no preceding events and a "jump" into the future.)*

Factor IV: In these stories, the central figure is aloof, markedly emotionally detached from others, and the events seem to be have an "as-if," make-believe quality or fabricated, like omnipotent conceits.

e.g., Subject # 18 (0.52)

"Child seems to be in deep study or thinking, concentrating about his music... *(Examiner: Tell a story with a beginning, middle, and an end.)* The guy is just, he seems to be very interested and serious about his music, maybe he's grown tired of it and getting sleepy - - but I think he's concentrating on violin and music... *(Examiner: How will it end?)* Well, he will get up and go to bed and go to sleep and study the next day and feel better when he's studying. I don't guess it would ever end — if interest, he just keeps practicing until he gets better and improve till he's so old he couldn't play the violin anymore until death or something interfered 'till he couldn't play no more." *(Note: no past events, little continuity of events, and external forces interfere with self-efforts.)*