DYALOG: A Computer-Based Measure of Conversational Performance

Norman P. Erber
School of Human Communication Sciences
La Trobe University

Dyalog is computer software developed for measurement of functional communicative performance. During live or videotaped conversation between a client and partner, the clinician simply pushes a button during breakdowns and repair. The computer displays a line graph of fluent and non-fluent conversation, and also displays numerical data: duration/proportion of conversation time occupied by breakdown and repair; number of breakdown and repair events; and average time per event. As an outcome measure, Dyalog can be used to demonstrate the benefits of situational change (e.g., reducing noise) or the benefits of long-term communication therapy. Clinical applications are discussed.

Speech-language-hearing clinicians help people with communication disorders in many ways. In the course of therapy, the clinicians may: train the client in self-help procedures, train frequent communication partners in proactive strategies, advise the client on the optimal use of assistive devices, or show the client how to modify the social or physical environment for best communication (Erber, 1996).

Typically, clinicians want to measure outcomes of the therapy that they provide. There are at least three reasons: (a) to validate or justify a therapeutic strategy, (b) to demonstrate progress to the client and to the client’s family by comparing performance before and after treatment, and (c) to obtain reimbursement for therapy from an insurance company or a government agency.

Different types of outcome measures are available. Subjective data are quickly obtained by means of a report or assessment by the client, the clinician, or another person. Examples of subjective data include: (a) the client’s reported use of a

Correspondence concerning this article should be addressed to Norman P. Erber, PhD, School of Human Communication Sciences, La Trobe University, Bundoora, Victoria, Australia 3083.

69
communication aid or device (Muircu, Tulse, & Aguilar, 1992); (b) assessment (rating) of handicap by the client or another person, reflected in perceived ease of everyday social or communicative behavior (Demorest & Erdall, 1987; Katz & Lytrel, 1963; Newman & Weinstein, 1986); (c) assessment (rating) of anxiety or stress that is experienced during everyday interaction by the client or another person (Brooksstein, 1977; Craig, 1990; McCroskey, 1984); and (d) satisfaction with communication (Oates, Locht, & McMahon, 1990).

Other outcome measures are more objective. But data collection may involve special procedures and equipment, or may require a considerable amount of time. Examples of objective data include: (a) per cent words or sentences identified by the client (Menkel & Dantau, 1977), (b) the client's speech intelligibility (Brideg, 1991; Kent, 1992), (c) narrative tracking rate (DeFilippo, 1988; Tye-Murray & Tylor, 1983), (d) efficiency of information exchange (Davis & Wilcox, 1985; Yorkston, Beukelman, & Flowers, 1980), and (e) the variety and number of strategies applied by the client when misunderstandings occur (Blalock, Scudder, & Wynne, 1995; Erber, 1995; Tye-Murray, 1991).

CONVERSATIONAL PERFORMANCE

Clinicians have recognized for many years that improvement in a client's conversational performance is an important rehabilitative goal. A variety of conversation-based therapies have been developed for this purpose (Davis & Wilcox, 1985; Erber, 1996). Conversation-based therapies are attractive to both clients and clinicians because they reflect the communicative activities of daily living.

To monitor changes in clients' conversational normality or fluency, clinicians have successfully employed rating scales (Erber, 1996). Rating scales, however, are subjective, routine training of raters, and may be difficult to apply if fluency fluctuates within a conversation. Clinicians also have engaged in detailed analysis of conversational behavior to specify client needs (Cassie & Rockwell, 1993; Tye-Murray & Win, 1996). This type of measurement, however, can be tedious and typically requires far more time for analysis than the original conversational sample. It is apparent that clinicians need a simple, quick, and objective method to routinely assess the conversational benefits of therapy.

GENERAL INFORMATION ABOUT DYALOG

Dyalog is a computer-based method that has been developed for routine measurement of a client's functional conversational performance. The result is a line graph or "cumulative record" (Skinner, 1972) which depicts the amount of time that two people participate in fluent and non fluent conversation.

HOW DYALOG IS USED

Dyalog is extremely easy to apply in practice. To use Dyalog, the clinician
first chooses the behavior to be examined (e.g., breakdown/repair). Then the clinician selects the amount of conversation to be evaluated (e.g., 2 min). Conversational topics may be randomly selected from a deck of cards (e.g., shoes, camping, chocolate, furniture). Conversational conditions may be compared: with/without an assistance communication device, at a near/lar distance, in a quiet/noisy room, with/without visual cues, with an experienced/unexperienced communication partner, or before/during/after communication therapy.

The clinician carefully observes a sample of conversation either live or recorded on videotape. While the conversation flows smoothly, the clinician does nothing. Whenever the conversation breaks down and repair is required, the clinician depresses and holds down the space bar on the computer keyboard. When the participants have restored fluent conversation, the clinician releases the space bar. These simple rules are applied throughout each sample of conversation that is assessed (see Table 1).

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not press the space bar.</td>
<td>Whenever fluent conversation is in progress</td>
</tr>
<tr>
<td>Press the space bar and hold it down.</td>
<td>Whenever conversation breaks down and repair is required</td>
</tr>
<tr>
<td>Release the space bar.</td>
<td>When fluent conversation has been restored</td>
</tr>
</tbody>
</table>

At the end of the sample of conversation, the computer automatically displays a line graph that summarizes the clinician’s analysis (see Figures 2 and 3). Time periods of normal conversation are shown as flat line segments; time periods of disordered conversation are shown as downward sloping line segments. The point where the line graph intersects the right vertical scale indicates the total amount of time occupied by breakdown and repair.

The Dyalog program also automatically computes and displays four numerical scores that clinicians can use to describe conversational performance (see Table 2):

- the total amount of conversation time, in seconds, that contained breakdown and repair;
- the proportion of total conversation time that contained breakdown and repair;
- the number of breakdown and repair events; and
- the average time, in seconds, per breakdown and repair event.

In general, all these numerical scores decrease as conversational performance improves. Thus they can be used to demonstrate the positive results of commun-
Table 1
Data Obtained During Conversations With a Client (E.M., Female, Age 84) Who Listened With and Without a Portable Amplifier. Numerical Data (Conversation Time = 120 s)

<table>
<thead>
<tr>
<th>Breakdown/repair</th>
<th>With amplification</th>
<th>Without amplification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time in seconds</td>
<td>8</td>
<td>6.4</td>
</tr>
<tr>
<td>Prop. of total conversation time</td>
<td>0.7</td>
<td>0.53</td>
</tr>
<tr>
<td>Number of e-vents</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Average rate in seconds per event</td>
<td>4.0</td>
<td>10.7</td>
</tr>
</tbody>
</table>

Communication therapy. A printed copy of the line graph and the numerical data are available for clinical records, and/or each client’s results may be stored in the computer for later examination.

COMPARISON OF DIALOG WITH RATINGS OF CONVERSATIONAL FLUENCY

Clinicians often use subjective ratings to assess conversational fluency (Erber, 1994, 1996). These ratings correspond to the proportion of conversation time that flows smoothly without breakdown and repair (Erber, 1996). Preliminary

![Graph of conversation time vs. breakdown/repair ratings](image)

Figure 1. Approximate regions of the Dialog plot that correspond to subjective conversational fluency ratings of 1, 2, 3, and 4.
observations suggest that Dyalog results are related to student clinicians' subjective ratings of conversational fluency on a 4-point scale. That is, videotaped conversations which they rate reliably as 1, 2, 3, or 4 tend to yield line graphs within the general regions of the Dyalog plot shown in Figure 1.

We have observed that some conversations, however, are not easily assessed with a subjective rating scale. Occurrences of breakdown and repair may be concentrated at the beginning of the conversation when the client is orienting to the topic, or at the end of the conversation when the client is fatigued. The amount of time required for resolution of breakdowns may vary throughout the conversation. The result may be a Dyalog line graph that bends or curves (see Figure 2). Conversations of this type (where the line graph appears to pass through two or more regions within the borders of the Dyalog plot) typically yield unreliable ratings. Different raters may not agree on the number to assign, for example, because each rater may attend to or remember a different factor or a different part of the conversation. In such cases, where subjective ratings of conversational fluency are unreliable, the clinician can use the printed Dyalog line graph to describe the progress of the conversation unambiguously.

CLINICAL EXAMPLE

"Instant therapy" (Erber, 1996) is the systematic application of situational
change whose effects are evident without extensive training of the client or the communication partner. E.M. (female, age 84 years), a nursing home resident with a moderate age-related hearing loss (better-ear 3-frequency pure tone average = 52.1 dB HL), received instant therapy in the form of amplification through a portable amplifier (Tandy Stereo Amplified Listener V-1093A) connected to lightweight stereo earpieces (Nova-42). The amplifier was set at 1/2 volume and high-frequency emphasis, as preferred by E.M. The communication partner, a student clinician (female, age 23 years), held the amplifier case beneath her chin so as not to obscure the mouth and spoke across the microphone grille at a distance of about 50 mm (Eiber, 1994). She sat 1 m from the client and faced the windows to maximize visual cues.

As the partner engaged in face-to-face social conversation about grandchildren with E.M., another student clinician (female, age 25 years) pressed the space bar on a small laptop computer whenever E.M. requested clarification and held the space bar down during participants' attempts to restore fluent conversation. She released the space bar whenever conversation was restored.

Figure 3 and Table 2 show typical Dyalog results obtained during two different 2-min conversations with E.M. - with and without the portable amplifier. The considerable improvement in conversational fluency that occurred when E.M. listened to sound amplified through the assistive listening device is evident in the difference between the two use graphs and also between the two sets of numeri-
cal summary data. For example, without amplification, breakdown and repair-occupied 64 out of 120 s, but with amplification, breakdown and repair occupied only 8 out of 120 s. This information can be used to support a clinician’s recommendations that care staff regularly use a portable amplifier and earphones when conversing with E.M.

IMPLICATIONS FOR THE CLINICIAN

Clinicians report that Dyalog software is easy to use in practice, especially after one has acquired a basic theoretical understanding of the particular behavior selected for observation. The line graph permits one to apprise overall conversational performance at a glance. The numerical data permit conversational performance to be quantified. The printed results provide a clear, objective summary of a client’s conversational behavior under different conditions or at different times. As a functional outcome measure, Dyalog can be used to demonstrate the benefits of situational change as well as the benefits of long-term communication therapy.

ACKNOWLEDGMENTS

Appreciation is expressed to Wendy Mac Report for assisting with data collection, and to Kim Marks, whose research on clinical applications of conversational fluency rating led to the development of Dyalog. Dyalog is produced and distributed by Paresi Software, [http://www.paresi.com]. A PC with Windows 3.x or 95 and 8 MIB of RAM is required.

REFERENCES


