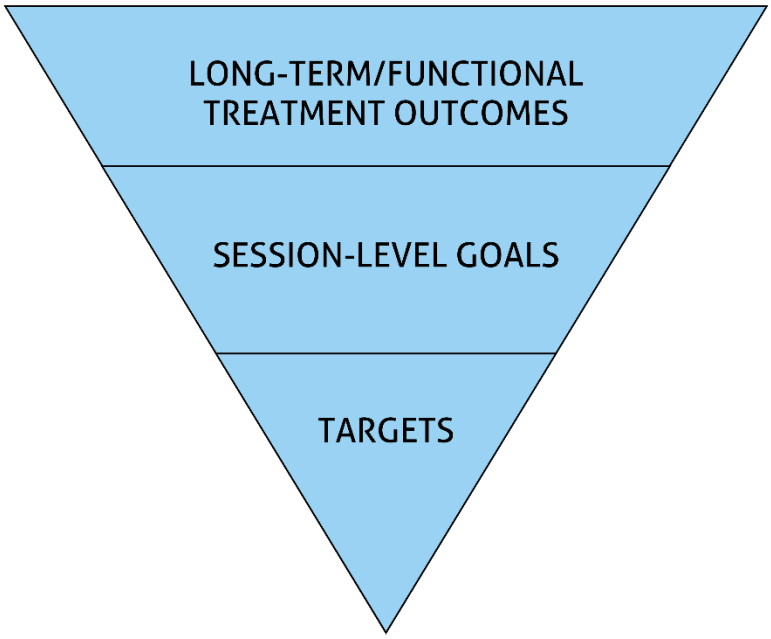
Supplemental Material S1. Treatment parameters and terminology: The current state of the field.

Treatment is complicated with many factors to consider. For example, most treatment plans could be thought of as an inverted triangle with long-term, functional goals on top, session-level goals in the middle, and individual targets on the bottom.



A useful reporting guideline is the template for intervention description and replication checklist (TIDieR; Campbell et al., 2018; Hoffman et al., 2014). The checklist contains 12 items and includes the corresponding page numbers of where each item is located in the current manuscript (seen in Table 1 within the main text). While most of these items are straightforward, there is the potential for confusion in Item 8, which aims to characterize "When and how much" of an intervention was delivered. We propose that, in order to answer this question, the researcher or clinician needs to specify to which portion of the triangle they are referring as well as clearly specify terms used.

Let us take duration as an example. The duration of a session may be 30 minutes. However, if a clinician is targeting two different goals within that session, we may be more interested in the duration of the intervention *per session goal*, or potentially even *per individual target*. To illustrate, imagine a clinician targeting both an articulation and a language goal during a 30-minute session. If the clinician spent 20 minutes on the language goal and 10 minutes on the articulation goal, that would be important to know. If this information is not broken down by goal, and someone reported that they worked on a child's goals for 30 minutes, 2x week, over 15 weeks, others might wrongly assume that a child had 900 minutes of articulation treatment, when in fact, the clinician only actually worked on articulation for 300 minutes. In some cases, it might even be important to know how much time was spent on each individual target within a session, given that it might take more time to remediate an /r/ than it does to remediate an /f/. If all of the duration information is collapsed into a single number instead of subdivided by targets or goals,

clinicians will not have a sense of how much time is really needed to effectively treat a given target or goal.

Specifying and Defining Treatment Terminology

Dose. First, our definition of dose differs from other definitions in the literature. For example, some people define dose as a unit of time, such as the number of minutes a clinician spends addressing a grammatical target in a session (e.g., Justice, 2018). Although this type of metric can be useful for large-scale effectiveness studies, the obvious drawback is that this metric does not account for variations in dose form (how the dose is delivered), dose number (how many doses are delivered), or dose rate (how many doses are delivered within a specific time period). It also does not allow for a focus on different targets or session goals. Dose has also been previously defined as "the *number* of properly administered teaching episodes during a single intervention session" (Warren, Fey, & Yoder, 2007, p. 71). The problem with this latter definition is that it highlights the *number* rather than the action itself. It limits the use of the term dose to a single metric for any given session, and although this is appropriate for some treatment approaches, it is not helpful when a clinician has more than one target per session, a highly likely situation. It also makes it difficult to convey other related parameters of an intervention (e.g., dose form) in a transparent and intuitive way.

So, we will not use the term dose in the way it has been described in previous studies in order to answer our research questions. By defining dose as the action in treatment that produces change, other derived terms that are used to describe treatment parameters (e.g., dose form, dose number, and dose rate) become more transparent and intuitive. We are then better equipped to describe details of parameters pertaining to both the session and individual targets (refer to Figure 1 in the main text). We are able to describe how we held both the total number of doses per session and dose rate constant, while manipulating the number of doses per target word per session and number of target words per session. Additionally, we are better equipped to describe how we manipulated the number of doses per target per session in order to discover which parameters lead to the best treatment outcomes.

Dose rate. Dose rate is often underspecified or not mentioned at all in intervention studies. Zeng, Law, and Lindsay (2012), for example, review 20 intervention studies and outline various treatment parameters used in each. Of these 20 studies, seven are vocabulary interventions, none of which report information on dose rate. Cable and Domsch (2011) similarly found in their systematic review that most studies on word learning interventions for late-talking toddlers provide insufficient detail related to dose rate. One study they reviewed was a vocabulary intervention with late-talking toddlers by Robertson and Ellis Weismer (1999). They stated that each treatment session lasted 75 minutes and incorporated general language stimulation. Although session duration was specified, a key intervention detail was not reported: the dose number per session (i.e., the number of times a single action of language stimulation occurred). This piece of missing information makes it impossible to calculate the dose rate used in their treatment. The majority of other studies included in Cable and Domsch (2011) also lacked crucial details used to calculate dose rate. Even though their review showed promising effect sizes for these interventions with late-talkers, it remains unclear which specific treatment parameters were responsible for the successful outcomes. Without information on specific parameters such as dose rate, it is impossible for clinicians to accurately translate these methods to clinical practice.

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