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Tracking Intervention Dosage to Inform Instructional Decision Making

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Abstract

Intervention dosage is an often-overlooked aspect of implementation fidelity. Tracking intervention dosage is critical for ensuring students with disabilities were present for and received the intervention for as many minutes as intended. Used in tandem with student performance data, intervention dosage can provide a clearer picture of intervention success. This article presents strategies for how teachers can plan for, collect, and use intervention dosage data to inform instructional data-based decision making.

Teachers track a variety of data to assess whether or not students are learning as expected. Within a data-based individualization framework (National Center for Intensive Intervention [NCII], 2013), student performance data are collected weekly via a general outcome measure, such as curriculum-based measurement (CBM; Deno, 1985). After graphing and tracking student performance, teachers can analyze CBM data to know when an instructional change is needed. However, without a clear picture of whether students are present for and receiving the intervention, teachers might make an unwarranted instructional change. Teachers should collect data on whether or not an intervention was delivered as intended, including whether students were present during intervention. Keeping track of intervention dosage in conjunction with CBM data can inform what needs to change—perhaps the intervention itself, but maybe some other factor that prevents a student from regular intervention attendance. Together, these two types of data are necessary to support teachers' accurate and timely instructional decision making.

Implementation Fidelity

Delivering an intervention as intended, or implementation fidelity, is central to intervention effectiveness (Fixsen et al., 2009) and for making sound decisions related to a student's responsiveness to intervention (Cook & Odom, 2013). Although the term "fidelity" is primarily used to mean intervention adherence, implementation fidelity is actually a multidimensional construct that includes, in addition to adherence, intervention dosage or exposure, delivery quality, participant responsiveness, and program differentiation (Dane & Schneider, 1998). One reason teachers may not be aware of the multiple dimensions of implementation fidelity is that researchers rarely monitor and systematically collect data on those dimensions (Reinke et al., 2013). Although each component of implementation fidelity is critical, one often-overlooked dimension is intervention dosage.

Intervention Dosage

Quality indicators in special education research call for intervention dosage data to be collected and reported as part of the research process (Cook et al., 2015), yet recent research reveals intervention dosage is scarcely reported

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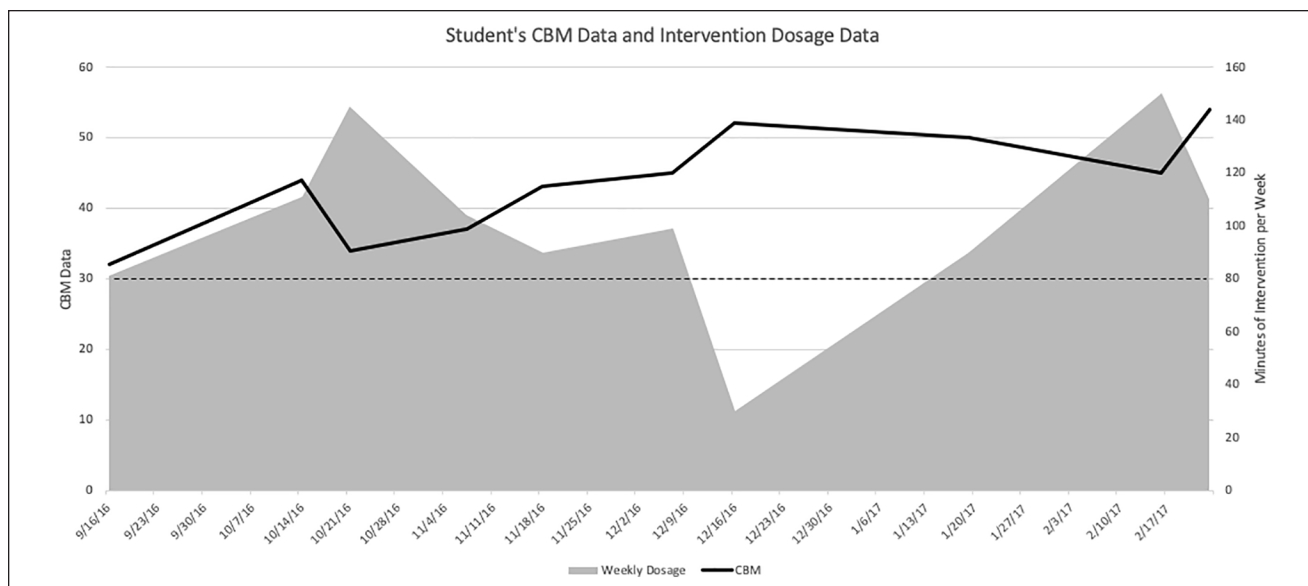Email: ericamason@mail.missouri.edu

Figure 1. Sample graph that shows the student's dosage data and CBM data, side by side.
Note. CBM = curriculum-based measurement.

(Capin et al., 2018). In their systematic review, Capin et al. (2018) examined the current landscape of reading intervention literature to uncover how, among other things, authors attended to issues of implementation fidelity across a 10-year time frame. Of the 83 studies that reported implementation fidelity, 14 studies reported using multiple implementation fidelity measures, and of those 14 studies, only two included measures of intervention dosage. In light of the scarcity of collected or reported intervention dosage data, the authors called for the inclusion of multiple dimensions of implementation fidelity so that teachers could gain a clearer picture of how the intervention was implemented and what effects it had on student outcomes. The Capin et al. (2018) study points to the importance of intervention dosage, especially as it relates to the work of classroom teachers.

What is intervention dosage? While many might associate the term "dosage" with the medical field, usage of the term within education research can be similarly understood. In the medical field, dosage refers to the amount and frequency a person should receive medication or treatment. In education, dosage refers to the amount and frequency a student should receive intervention. Similar to how doctors determine a medicine's dosage, educational researchers determine an intervention's dosage. Thus, intervention dosage (see Note 1) has traditionally referred to the amount of instruction provided, which typically includes the number of intervention sessions and the length of each session (Dane & Schneider, 1998). Other researchers have characterized intervention dosage as "the number of opportunities students have to respond and receive corrective feedback" within a

given session (Fuchs et al., 2017, p. 196). The intent of the definition presented by Fuchs and colleagues was to guide the systematic intensification of intervention packages (i.e., modifying the intervention to increase the number of opportunities a student has to respond), whereas, in this article, the phrase "intervention dosage" is an indication of whether or not the student was exposed to the intended or planned number of opportunities to respond (i.e., intervention dosage as it relates to implementation fidelity).

Intervention dosage and assessment data. CBM is a brief assessment that is reliable, valid, and sensitive to growth within academic domains (e.g., reading, mathematics, writing; Deno, 1985). When CBM data are used for progress monitoring, weekly performance should be graphed to determine whether or not students are making progress toward their goals (e.g., NCII, 2013, for more information about visual analysis of CBM data and instructional decision making). In addition to these graphed CBM data, intervention dosage data should be used in conjunction with general implementation fidelity data to interpret student responsiveness to intervention and make instructional decisions. For example, a teacher may see that a student is not making expected academic progress according to CBM data alone, but, when cross-referencing CBM data with intervention dosage data, they notice that the student has also been consistently missing scheduled intervention time (see Figure 1). In this case, the teacher may decide that the problem is with student attendance, as opposed to determining that the intervention itself is ineffective.

Consider how the different causes of the student's unresponsiveness would warrant different instructional responses. If it were determined incorrectly that the intervention was not successful, a teacher might needlessly make significant modifications to the intervention materials, practices, or content or select a different intervention altogether. On the contrary, if it were determined that the student was missing intervention time, a teacher might conference with the student's family or seek the support of colleagues in getting the student to intervention on time and minimize disruptions. Collecting intervention dosage data and examining them in relation to CBM data can help teachers make comprehensive informed decisions about whether or not a student is making progress. To illustrate this, the following vignette is offered, which is a fictionalized account drawn from several authentic situations (see Note 2).

Alex, a research assistant at a nearby university, arrives at Ms. C.'s class to observe implementation of a writing intervention with a small group of third-grade students. Ms. C. is a special education teacher participating in a research project examining the effectiveness of an intensive early writing intervention. As part of the project, Alex observes instruction every 2–3 weeks. Today, Alex is collecting data to see whether Ms. C. delivers the intervention as intended (i.e., intervention adherence) and the extent to which the students are actively responding during instruction. The intervention is intended to be delivered in 30-minute sessions 3 days a week.

Today's lesson is scheduled to start at 10:00 a.m. and end at 10:30 a.m. Alex notes that one student is delayed in getting to class because they were held back by another teacher to talk about a missing assignment. As Ms. C. delivers the intervention, the assistant principal calls two students into the hallway to talk about a conflict that happened the day before. During the remaining intervention time, one student uses the restroom and another spends time out of their seat looking for a pencil. By 10:30 a.m., Alex notes that the intervention was delivered for the intended 30 min with acceptable adherence and high rates of overall active student responding. However, in conversation after instruction, Ms. C. and Alex realize that not all students received the full 30 min of intervention because of unanticipated interruptions.

Challenges to collecting intervention dosage data. There are two primary challenges to collecting and analyzing intervention dosage data. First, within existing intervention research, when intervention dosage data are collected, they are reported at the teacher level (i.e., time the teacher delivered the intervention) rather than at the student level (i.e., time individual students actually received the intervention; Capin et al., 2018).

Second, classroom teachers, who often serve as interventionists, might not have the necessary supports or resources to implement an intervention with fidelity (Cook & Odom, 2013; Sandall et al., 2004), let alone track intervention dosage. In addition to what is reported in the intervention literature, tracking student-level intervention dosage data poses a logistical challenge. Many teachers struggle to integrate intervention dosage data tracking into their instruction routines and therefore do not collect these data (DuPaul et al., 2006) or collect intervention dosage data infrequently, which results in intervention dosage inaccuracies (Taber-Doughty & Jasper, 2012).

In practice, this means teachers need to devise a system for tracking the amount of time each student spends in intervention on a session-by-session basis, as well as continuing to track weekly CBM data. This intervention dosage data can serve to guide teachers in making timely and effective instructional decisions. This article provides several tools for accurately tracking and reporting intervention dosage data. In addition, the vignette presented earlier will be revisited throughout to underscore the importance of accurate intervention dosage data tracking and to describe how the data may be used to inform instructional decision making.

Intervention Dosage: Tips for Tracking

Intervention dosage recording should be simple, efficient, and informative. Teachers are encouraged to create a system for tracking intervention dosage data so that it becomes part of their everyday routine. In addition to some applications and web-based programs, there are also tracking systems that do not require technology. The following sections describe tools teachers might use to create an intervention dosage data collection system, including specific examples of systems that have worked for teachers we have supported through research projects.

Low-Tech

One low-tech way to track intervention dosage data is to create an intervention dosage log where teachers can track data for all of their students on one form. Teachers have found that keeping their log in the area of the classroom where they conducted the intervention prompted them to complete the log each day. A dosage log can be as simple as a chart with the dates for the duration of the intervention listed across the top row and the initials of students who are participating in the intervention listed in the first column. Teachers should also create a coding system to track the specific reasons a student misses instructional time (e.g., CLASS could mean at school, but in another class). In addition to these codes, teachers could come up with a simple color-coding system so that visual analysis of the intervention dosage log could quickly reveal patterns. Either of these coding systems would allow teachers to notice when students were consistently missing intervention time.

While a teacher-created intervention dosage log can be a useful first step, teachers are encouraged to use existing resources. One example of a low-tech intervention dosage log is one created by the NCII (https://intensiveintervention.org/sites/default/files/DBI_Weekly_Log_508.pdf). The first page of the data-based individualization implementation log is designed to capture exactly the information described in this article. In addition to noting whether or not a student had the opportunity to receive the intervention (i.e., "intervention offered?" column), this log also makes space for noting whether students were present and to what degree they were engaged. A teacher could increase the specificity of this log by adding a column to track any interruptions that occur (e.g., restroom break), denoting how many instructional minutes were lost during a given interruption.

Teachers may also consider having students track their own intervention dosage data. Having students record intervention dosage data has several advantages, including that it (a) teaches self-monitoring skills, (b) distributes responsibility, and (c) allows for intervention dosage to be recorded when the teacher is not present. For example, each student may have their own intervention dosage log upon which they record the date, time started, time stopped, and any interruptions. Another method could include having all students check in and out on a common form. Students could sign themselves in and out when they leave intervention for any reason. A student-led system might require that a teacher schedules regular reliability checks where they track intervention dosage and then compare their log with a student's log.

High-Tech

One way to make an intervention dosage log accessible and easy to manage is to create an electronic version, which might come with features that support teachers in adopting this habit, like the ability to set daily reminders or alerts. If teachers use an electronic calendar system, creating a daily appointment to track intervention dosage data might provide a needed prompt for teachers to complete their logs. If teachers want an electronic prompt and an electronic log, they could creatively use existing applications or web-based programs in tandem. Several applications are available for use on tablets or cell phones that allow individuals to set daily prompts that arrive to designated recipients through text messages or emails. The frequency, timing, and content of these messages can be customized for different recipients (e.g., Google Forms, SurveyMonkey). For example, a teacher could use the *Remind* application (Remind101, Inc., 2018) to send themselves a link to a Google Forms survey for collecting intervention dosage data via text or email at the beginning of a scheduled intervention time. It is important the data be recorded as close

to the intervention time as possible to minimize inaccuracies (see Taber-Doughty & Jasper, 2012).

After realizing that students were not necessarily receiving the intervention as intended, Ms. C. designs a system to collect intervention dosage. She decides a combination of low-tech and high-tech would work best. First, she creates a daily reminder through the Remind application on her cell phone and schedules the reminder to occur at the end of intervention time every day. Ms. C. remembers getting copies of the intervention dosage log created by the NCII at a recent professional development and decides to use it. When she receives her daily reminder, Ms. C. finds her paper logs, which are kept in a folder on her desk, and tracks students' intervention dosage for the day. Just by starting this practice, Ms. C. is now very aware of when students are or are not actually receiving the intervention.

Graphing

Teachers may find that establishing a system for intervention dosage tracking is relatively simple. What may be less intuitive is translating the data into a usable format that will give rise to analysis and decision making. The first step is to transfer intervention dosage data to a spreadsheet that allows for easy graphing and the integration of CBM data. Within a spreadsheet program, such as Microsoft Excel, the teacher should record total minutes in intervention by date and/or session. Teachers can then create a graph that demonstrates the student's time spent receiving intervention on a session-by-session basis (i.e., represented by a line graph, shaded to the *x*-axis), including sessions they may miss for various reasons. The horizontal dotted line represents the minimum number of intervention minutes expected for implementation fidelity. Teachers can include a student's CBM data on the same graph (i.e., represented by a line graph, overlaid on the shaded line graph) so that a direct comparison can be made, as in Figure 1.

In this example, it is not surprising to see how the student's weekly CBM performance varies across weeks in relation to the amount of intervention during each week, including variations in intervention dosage due to the school schedule, such as holidays. This visual representation may be effective for communication with the student, their family, other teachers, or even school administrators. Teachers could show the intervention dosage in conjunction with CBM data to clearly illustrate the impact of missing intervention time and underscore the importance of protecting intervention time.

Getting Started

When teachers have simple and reliable intervention dosage data collection tools, a way to integrate these tools into existing instructional routines, and a clear purpose for why

collecting these data is important, the intervention experience can be enhanced for students. To get started, teachers should answer the following questions to determine what collecting intervention dosage data might look like for them:

1. Do I prefer paper or electronic means of data collection?
2. Do I prefer to collect all of the data myself or do I want to recruit student participation?
3. What applications (e.g., Remind), programs (e.g., Excel), or websites (e.g., Schoology) do I already use? (3a) How can programs I already use be modified to collect intervention dosage data?
4. How can I remind myself to track intervention dosage in conjunction with intervention delivery?
5. How do I intend to transfer data into a spreadsheet that will graph intervention dosage data for me?
6. Can I combine intervention dosage data collection with my current progress monitoring data collection routine?

Instructional Decision Making

While the intervention itself is an important aspect of supporting students, tracking and analyzing the details related to intervention dosage can support teachers in making informed and holistic instructional decisions regarding whether or not to adjust the intervention or alter some other aspect of the environment. Once teachers have intervention dosage data, it is important they integrate the data into instructional decision making. Typically, teachers look at graphed CBM data and ask the following:

1. What is the level of the data points?
2. What is the trend of the data points?
3. Is there any variability among the data points? All of these questions are answered when the level, trend, and variability of the data points are compared with the student's goal line (NCII, n.d.).

Intervention dosage data should be incorporated into decision making by asking the following questions:

1. Do single, unusually high or low CBM data points correspond to increases or decreases in intervention dosage across that week?
2. Is there a relation between CBM level and intervention dosage (e.g., Do 2 weeks of missing intervention time correspond with two CBM data points below the goal line or at a decreased [i.e., flatter] rate of growth?).

Teachers using the NCII data-based individualization implementation log could use the second page to evaluate how implementation went over the past week. Here, teachers could again add specificity to these questions by examining whether, despite high rates of intervention adherence, some students did not receive the full intervention due to unanticipated classroom interruptions. If the teacher determines that the student is missing intervention time and that intervention dosage appears to have an impact upon performance, then the teacher should determine why the student is missing instruction and what can be done to facilitate increased intervention dosage.

After 8 weeks of intervention delivery, Ms. C. looks at her students' graphs to determine whether or not the intervention requires an adjustment. Each graph includes a student's CBM progress, as well as intervention dosage. Looking at the CBM data alone indicates that one student is not making expected progress on a word-level writing measure, despite Ms. C.'s high rates of intervention adherence. Because Ms. C. has intervention dosage data alongside the CBM data, she sees a clear pattern of missing intervention time for the student. Before collecting intervention dosage, Ms. C. had a professional hunch that this student was missing a lot of instructional time; however, by systematically collecting intervention dosage, her hunch is confirmed. Ms. C. now has evidence that missing intervention time might explain why the student is not making expected progress.

How to Increase Intervention Dosage

CBM data may indicate when a change is needed and intervention dosage data may indicate what changes are needed, but neither of these sources of data indicates how intervention dosage should be increased. If it is decided that inconsistent intervention dosage is the primary reason a student is not progressing, then other data sources, such as daily codes in an intervention dosage log, will need to be consulted to determine why the student is missing instruction. When it has been determined that a student is not receiving the intended intervention dosage, teachers might be tempted to simply increase the intervention dosage by adding instructional minutes for this student. While this may be the best option, teachers should remember that minutes added to intervention time are minutes taken away from some other time. Given this, what other options might be considered?

In-Class Adjustments

First, teachers should examine their own classroom context during intervention time by asking themselves these reflective questions:

1. Are students actively participating in instruction for the majority of the class time? (1a) Is instruction being delivered at an appropriately brisk pace? (1b)

Are there sufficient opportunities for the student to respond? (Fuchs et al., 2017).

2. Is the intervention environment conducive to learning? (2b) Is the environment distraction-free during intervention (e.g., visitors, announcements)? (2c) Are students comfortable in the chairs, desks, or tables provided?

3. Is intervention time being maximized? (3a) Are transitions into the classroom and between activities efficient? (3b) Has instruction been designed to minimize "downtime"? (3c) Are materials prepared in advance and easily accessible? (3d) Could student needs that consistently interrupt instruction (e.g., restroom breaks, snacks) be addressed prior to intervention?

The answers to these questions might identify an aspect of instruction that can now be targeted for improvement. In addition to professional reflection, teachers could invite a colleague, instructional coach, or administrator to observe intervention time to gather data and provide feedback. If it is determined that intervention time is being used to its fullest capacity but a student is in need of additional intervention time, teachers may need to partner with other personnel in the building to find creative solutions to facilitate this increase. In addition to working with the student's Individualized Education Plan team, decisions about increased intervention time will depend on existing school-wide systems that might support this need (e.g., multitiered systems of support framework).

Another in-class consideration is the student's point of view. Among other reasons, students might engage in disruptive behavior or escape-motivated behavior (e.g., strategically timed restroom breaks) when there are not clear behavioral expectations or when the task is not at the appropriate level of difficulty. Consider whether or not the student understands the behavioral expectations during intervention, including instructional routines. Best practice suggests revisiting expectations frequently and providing students with multiple opportunities to practice and get feedback on demonstrating behavioral expectations. Teachers might also consider assessing the student's current skills to ensure that the content of intervention instruction is appropriately ambitious for the student (i.e., not too easy and not too difficult).

Out-of-Class Adjustments

Upon gathering and analyzing intervention dosage data, teachers may discover the student is regularly at school, but other factors consistently interrupt intervention time. If the student is regularly missing intervention because other adults divert the student elsewhere, then document missed intervention time, the reason, and maintain clear and professional communication with colleagues.

Now that Ms. C. has identified low intervention dosage as related to the student not making expected progress in the writing intervention, she decides to first examine intervention time as a whole. Ms. C. video records her intervention sessions for 1 week and commits to analyzing them by asking reflective questions. After viewing the videos, Ms. C. notices that she regularly lets students use the restroom in the middle of intervention or spend extended amounts of time looking for materials. This observation prompts Ms. C. to adjust the environment by offering the group a restroom break before intervention instruction begins. She also creates a caddy of supplies that she positions near the intervention table so that students can access needed materials quickly.

For the student who was not making expected progress, Ms. C. also reaches out to the student's family for ways to increase school attendance and communicates with the student's other teachers about the importance of releasing the student in time to attend intervention. Ms. C. uses the graph of the student's CBM data and intervention dosage to illustrate the influence the student's absences may have on their opportunity to make academic progress.

Conclusion

Intervention dosage is an often-overlooked aspect of implementation fidelity. However, teachers can take simple steps to think about, collect, and use intervention dosage to inform instructional decision making. In addition to establishing intervention dosage data collection as an integral part of an instructional routine, it can add another level of nuance to teachers' instructional decision making. Instead of starting from scratch or making unnecessary changes, intervention dosage data can point teachers toward instructional adjustments that get at the root of why a student might not be making the progress expected in an intervention. Finally, intervention dosage data collected in tandem with CBM data can be used as a powerful tool to facilitate conversation about student progress with the students themselves, their families, other teachers, and administrators.

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Notes

1. Usage of the word "dosage" in this article refers to educational interventions and not the administration of medication. The word dosage should not be interpreted to mean that either a learning disability or an emotional or behavioral disorder is a medical condition.
2. The vignette developed is a fictionalized account drawn from several authentic situations and presented as an aggregate scenario. The name of the teacher has been changed to a pseudonym.
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