A Spotlight on Treatment Intensity: An Important and Often Overlooked Component of Intervention Inquiry

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Treatment intensity, also described as treatment strength, is an elusive construct within the fields of education and social sciences (e.g., Warren et al. 2007). Yet, in the medical community, prescribing interventions according to strength and determining the therapeutic range are standard operating procedures. Doctors commonly provide prescriptions indicating the amount of the specified medication along with the frequency of medication consumption (e.g., twice daily), the total number of days or weeks the medication should be taken (e.g., 10 days), side effects to be aware of (e.g., drowsiness), and any other specifications such as time of day (e.g., morning and evening) and whether the medication should be consumed with food. As educators and psychologists refine their use of evidence-based practices when selecting and providing intervention supports for students struggling with academic or behavioral difficulties, greater specificity about what intervention is being selected, for whom, and under what conditions may result in more efficient and effective outcomes (APA Presidential Task Force on Evidence-Based Practice 2006).

The Importance of Treatment Intensity

Yeaton and Sechrest (1981) posited that a three-way interaction exists among treatment effectiveness (i.e., does the intervention work), treatment integrity or

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procedural fidelity (i.e., is the intervention implemented as intended), and treatment intensity (i.e., in what form does it work). Gresham (1991) expanded the three-part interaction described by Yeaton and Sechrest by suggesting that treatment resistance is defined by intervention-specific (acceptability, integrity, effectiveness, strength) and behavior-specific characteristics (chronicity, generalization of behavior change, tolerance of behavior, severity of behavior). Intervention effectiveness has garnered national attention with the support of legislation, such as the Individuals with Disabilities Education Improvement Act (IDEA 2004) and the Elementary and Secondary Education Reform Act (ESERA 2001), encouraging schools to implement scientific, research-based intervention programs and whole-school preventative services. Intervention clearinghouses (e.g., National Registry of Evidence-Based Programs and Practices; What Works Clearinghouse) have been established that provide practitioners and educators access to reviews of available interventions that have varying levels of effectiveness to address a myriad of student problems. Web sites designed to support the implementation of effective programs have been developed such as the National Center on Response to Intervention (www.rti4success.org) and the Positive Behavioral Interventions and Supports OSEP Technical Assistance Center (www.pbis.org).

Likewise, procedural fidelity has received recent attention for its importance in achieving the goal of widespread use of evidence-based practices. Several special issues on the topic have been published in journals, such as *Clinical Psychology Science and Practice* (Southam-Gerow and McLeod 2013), *School Psychology Review* (e.g., Sanetti and Kratochwill 2009), and in this journal—*Journal of Behavioral Education* (DiGennaro Reed and Coddling 2014). Numerous reviews on various aspects of the procedural fidelity literature have been conducted (e.g., Barnett et al. 2014; Griffith et al. 2009; McIntyre et al. 2007; Noell et al. 2014; Sanetti et al. 2011; Solomon et al. 2012; Swanson et al. 2013). Professional organizations and grant-funding agencies have encouraged the collection and study of procedural fidelity, yielding a rapid increase in the rate of publications targeting the topic since 2008 (DiGennaro Reed and Coddling 2014).

However, less is known about treatment intensity. Despite the relative lack of evidence defining or describing treatment intensity (Daly et al. 2007; Warren et al. 2007), multi-tiered data-based decision making frameworks such as Response-to-Intervention (RTI; Fuchs and Fuchs 2006) are predicated on the idea that intensity—in terms of time allocated to treatment, delivery of treatment (e.g., small group, individual), resources required, and personnel expertise—is altered according to student needs (Barnett et al. 2004; Gresham 2004). Consequently, determining what variables are useful for differentiating treatment intensity and how the various dimensions of treatment intensity interact are necessary to study. Problems can be associated with intervention approaches that are too weak *and* too strong. Weak treatments can (a) result in behavior that becomes more resistant to change, (b) reduce motivation for students to engage in the change process, and/or (c) facilitate resistance from interventionists (Barnett et al. 2004; Yeaton and Sechrest 1981). Overly strong treatments can incur unnecessary costs (e.g., number of personnel required, materials purchased, time allocated) and lower acceptability of the treatment, which may in turn reduce future students' access to intervention

supports (Barnett et al. 2004; Gresham 1991; Lane and Beebe-Frankenberger 2004; Yeaton and Sechrest 1981).

Another area of scientific inquiry with important practical implications is how to adjust treatment intensity when student responsiveness is slow, absent, or progressing (e.g., Barnett et al. 2004; Shapiro 2011). It is possible that the simplest, most efficacious approach to adjusting treatment intensity is to add time to the session (e.g., increasing from 20 to 30 min sessions), increase the number of sessions per week (e.g., increasing from 3 to 4 days a week), or increase the number of total weeks the treatment is delivered (adding an additional 2 weeks; e.g., Duhon et al. 2009; Vaughn et al. 2010). In other cases, altering the complexity of the treatment by adding or subtracting treatment components (Coddington et al. 2011; Daly et al. 2007; Swanson, and Sachse-Lee 2000) or by varying the types of treatment components delivered may be important (e.g., Vaughn et al. 2010). For example, a self-monitoring component may be added to a Tier 2 reading group focused on improving reading comprehension skills to increase students' engagement in the supplemental instruction provided (Lane et al. 2013). Other modifications that could be made by educators and school professionals include the following: altering group size or composition, modifying the target skill to better match students' instructional levels, and changing the intervention that students are exposed to (Daly et al. 2007). Unfortunately, there is some evidence that the choices school personnel commonly make, such as adjusting intervention intensity primarily along group size dimensions (e.g., Mellard et al. 2010), contradicts what little evidence does exist pertaining to intensity variables that actually impact some student outcomes (e.g., Vaughn et al. 2010).

Defining Treatment Intensity

In Table 1, we provide an overview of treatment intensity dimensions from three selected theoretical papers (Barnett et al. 2004; Mellard et al. 2010; Warren et al. 2007). Seventeen dimensions were generated across studies with overlap found for only five aspects of intensity including treatment session length (minutes), treatment session frequency (per day/week), total treatment duration (weeks), number of practice opportunities supported by the treatment, and interventionist characteristics. Collectively, these dimensions of treatment intensity reflect both the quality and quantity of the intervention services delivered (Gresham 1991), such as the impact of length and schedule of treatment delivery, treatment group size, treatment design principles, the interventionist, and treatment implementation.

Probably, the most commonly recognized treatment intensity dimension is treatment dose. Although dose was described across all three papers as session length and frequency and across two papers as total treatment duration, other aspects of dose were also considered important. Warren et al. (2007) described the necessity of accounting for the number of teaching episodes accurately provided per treatment session as well as cumulative intensity (i.e., the product of all other dose variables). These authors suggested that various combinations of dose may be differentially important according to interventions, contexts, and student

Table 1 Defining and describing treatment intensity dimensions as defined in a selected sample of the literature

Treatment intensity dimension	Brief description	Barnett et al. (2004)	Mellard et al. (2010)	Warren et al. (2007)
<i>Dose</i>				
Learning trials/session	Number of accurately delivered teaching episodes during each intervention session			x
Session length	Number of minutes the treatment is delivered during each session	x	x	x
Session frequency	Number of sessions delivered per day/week/month	x	x	x
Length of treatment	Total duration of treatment provided, usually described in weeks		x	x
Cumulative intensity	Product of multiplying learning trials/session $\times$ session frequency $\times$ total length of treatment			x
<i>Group size</i>	Teacher to student ratio such as 1:1, 1:2–5, or 1:6–10		x	
<i>Treatment design</i>				
Form	Task or activity with or within which teaching episodes are provided			x
Positive corrective feedback	Amount, immediacy, and quality of interventionist or teacher-delivered feedback on student responses provided during individual treatment sessions		x	
Pace of instruction	Adjusting the speed with which new concepts or skills are taught according to skill mastery or students' needs		x	
Opportunities to practice or respond	Number of well-designed opportunities for students to practice or demonstrate skills or concepts	x	x	
Transitions between subjects or classes	Number of transitions between subjects or classes		x	
Goal specificity	How broad or focused instructional goals are		x	
Treatment complexity	Number and type of treatment components	x		
<i>Interventionist characteristics</i>				
Experience, knowledge, skills	Interventionist's training, certification, and mastery of quality intervention delivery	x	x	

Table 1 continued

Treatment intensity dimension	Brief description	Barnett et al. (2004)	Mellard et al. (2010)	Warren et al. (2007)
<i>Implementation characteristics</i>				
Intervention management and planning	Time the interventionist spends on the intervention activities (e.g., formative assessment, reviewing lessons, communicating with others)	x		
Materials and tangible resources required	Cost or time required to purchase or develop all necessary intervention materials	x		
Deviation from classroom routines	Number and type of tasks or activities that are modified from the traditional routines teachers or interventionists engaged in	x		

populations. For example, short treatment sessions administered daily might only need to be delivered for a few weeks. However, long treatment sessions administered twice weekly might need to be delivered for several months. That being said, the number of learning trials accomplished during one session may alter the frequency needed per week and the total treatment duration.

The dimensions of treatment intensity do not appear to be mutually exclusive. For example, Daly et al. in a follow-up article to Barnett et al. (2004) describe the idea of “engineering productive practice opportunities” (p. 574). To be productive, Daly et al. suggested that practice should be computed according to the number of student responses to instructional materials, which should be matched to each student’s instructional level, within the time allocated for instruction. In effect, this idea of productive practice time is similar to Warren et al.’s description of cumulative intensity but also takes into account the activity within which instruction is provided. Warren and colleagues described this as *form*. Furthermore, Daly and colleagues linked these various dimensions of dose with the opportunities for practice provided to students, an intensity dimension that was isolated by Mellard et al. (2010).

Treatment design dimensions of intensity included aspects that focused on each specific treatment session, such as treatment form, opportunities to practice, and quantity and quality of feedback provided by interventionists to students, as well as dimensions that tended to reflect treatment considerations between or among sessions, such as transitions, goal specificity, and treatment complexity. Pace might be described as the speed with which new skills or concepts are provided during each treatment session *or* throughout the treatment. Preliminary evidence indicates that for students requiring the most intensive service delivery, more may be better with respect to some of these variables, such as goal specificity and treatment complexity. That is, the more specific the task goals and the more treatment components delivered within the treatment package, the better the outcomes (e.g., Swanson and Sachse-Lee 2000; Vaughn et al. 2010).

Other aspects that fell under the umbrella of treatment intensity were specific to implementation of an intervention, such as the amount of training or experience of the interventionist, the level of assistance students require from interventionists to successfully access the treatment, the level of intervention management and planning required by interventionists, and the materials and other resources required to conduct the intervention. For example, the treatments that require more costly resources, time, management, planning, coordination among professionals, and highest qualifications for the interventionists are *theoretically* reserved for students with the most needs (e.g., Batsche et al. 2005; Gresham 2004), whereas the least intrusive, most parsimonious interventions are recommended for implementation with students experiencing fewer or less intense challenges (Barnett et al. 2004). The problem, of course, is the lack of existing research demonstrating the degree to which these dimensions singly or in some combination produce student improvement (e.g., Warren et al. 2007).

Treatment Intensity in the Context of Multi-tiered Systems of Support

Considerations regarding treatment intensity are particularly important now, as many school systems are embracing multi-tiered systems of support to meet students' educational needs. There are a number of such prevention models being implemented in schools such as (a) RTI models which focus primarily on academic outcomes in the area of reading and math; (b) positive behavior interventions and supports (PBIS; Sugai and Horner 2006) models which focus primarily on behavioral performance; and (c) Comprehensive, Integrated, Three-Tiered (CI3T; Lane et al. 2014) models that blend RTI and PBIS and incorporate a validated social skills program to address students' academic, behavioral, and social skills needs.

Whether implementing RTI, PBIS, or CI3T models, each offers a continuum of support that includes primary (Tier 1, for all students), secondary (Tier 2, for some students), and tertiary (Tier 3, for a few students) prevention supports that increase in intensity and focus. Each multi-tiered system of support is predicated on the notion of creating a framework for general and special education teachers to work collaboratively, efficiently, and effectively to (a) prevent learning and behavior challenges from developing and (b) identify and swiftly assist students for whom primary prevention efforts are insufficient. Ideally, each level of prevention includes evidence-based strategies, practices, and tactics that if implemented with adequate integrity *and* intensity will result in desired changes in student performance (Lane et al. 2013; Walker et al. 2014).

An essential element of these models is accurate, feasible screenings to detect students who need more than what primary prevention has to offer to meet their academic, behavioral, and/or social needs. A number of academic (e.g., AIMSweb; Pearson 2013) and behavior (e.g., the BASC-2 Behavior and Emotional Screening Scale; Kamphaus and Reynolds 2007) screening tools are now available to support these detection efforts. However, having reliable tools is not enough to adequately evaluate responsiveness. It is critical to also know what type of instruction is being delivered and the degree to which it is delivered as intended at each level (Lane et al. 2013).

Since 2011, research and teaching communities have begun to focus on the importance of examining treatment integrity in relation to decision making within tiered systems of support (e.g., Cox et al. 2011; Bruhn et al. 2014; Germer et al. 2011). Rather than examining data gleaned from academic and behavior screening tools and determining that a student is below benchmark in reading or at moderate risk on the Student Risk Screening Scale (Drummond 1994) and then providing relevant Tier 2 support, school-site teams are first asking important questions about Tier 1. What is the level of treatment integrity of Tier 1 efforts in the classroom? Is the student attending school regularly to access this instruction? If one were to find Tier 1 efforts were not being implemented as planned or if the student struggles with absenteeism, the first goal would be to improve delivery of Tier 1 instruction and improve student attendance rates rather than moving immediately to dedicating Tier 2 resources and support. The same would be true when examining the impact of Tier 2 support before moving to Tier 3. What is the level of treatment integrity of Tier 2 intervention? Is the student engaging in these Tier 2 interventions?

In addition to treatment integrity, another important but often overlooked issue that warrants attention is treatment intensity. As we work within tiered systems of support, important questions are now moving to the forefront as we explore issues of treatment intensity (e.g., dosage, complexity) and the variables that mediate and moderate the effectiveness of intervention efforts. As such we offer this special issue to launch the conversation regarding the importance of treatment intensity.

Overview of Studies in the Special Issue

This special series includes seven articles that purposefully examine multiple treatment intensity dimensions. The first three articles consider treatment dose dimensions. Ross and Begeny compared two classic dimensions of treatment intensity, group size and session length, using an alternating treatments design to test the impact of four combinations of these variables on oral reading fluency. The next article by Haegele and Burns also focused on reading outcomes. Using an alternating treatments design, Haegele and Burns examined the number of word repetitions, or learning trials per session were required for retention by students diagnosed with learning disabilities. The researchers taught words in sets of two, eight, and according to students' individual rates of acquisition to determine which produced the best retention most efficiently. In the third article, Neil and Jones used multiple baseline and alternating treatments designs to investigate how three aspects of dose (opportunities per session, session duration, and spacing of session opportunities) interacted with skill acquisition of students with Down syndrome.

The subsequent two articles in the series adjust intensity variables for application with class-wide interventions in math and writing. Given the context, the type and manner that treatment intensity dimensions are adjusted for treatment delivery to classes might be different than when services are delivered in small groups or individually. Duhon, House, Hastings, Poncy, and Solomon studied the impact of treatment complexity on class-wide computation fluency by comparing an explicit timing strategy with one that added performance feedback. Ennis, Jolivet, Terry, Fredrick, and Alberto examined whether implementing two specific mnemonics within Self-Regulated Strategy Development for fewer sessions per week than is typically recommended could result in improved writing and academic engagement when delivered class-wide to secondary students diagnosed with emotional/behavioral disorders in a residential setting. Using piecewise hierarchical linear modeling, these authors also explored moderators such as students' demographics, initial skill levels, and attendance.

The final two manuscripts investigated the implementation dimensions of intensity. Marsicano, Morrison, Momaw, Fite, and Klusen examined the use of a multi-component consultation support package and a consultation support package with fewer components to improve the math milieu teaching of three teachers using a non-concurrent multiple baseline design. Polanin and Espelage used an innovative analytical technique, with data from a large cluster-randomized control trial evaluating Second Step to explore several aspects of treatment intensity including

amount of teacher preparation time, additional financial resources expended by teachers, and the extent of outside consultation teachers received.

Finally, Paul Yoder provides a critical, thought-provoking commentary that encourages researchers and practitioners to systematically consider issues of treatment intensity, the influence of treatment intensity on student performance, and implications of such considerations for school-based practice.

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