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More Than Afterthoughts and Details: Maintenance and Booster Effects as Critical Elements of Intervention Research

Patrick H. Tolan

University of Virginia

Abstract

The set of studies in this special section bring into relief the importance of due attention to maintenance effects and use of boosters as critical components of intervention planning and evaluation, requiring theoretical and analytic forethought and direction. While some trends can be identified across these included reports and the other few studies of boosters in child psychopathology intervention, the main implication of work to date is to highlight the need to consider maintenance and booster effects analyses as more than afterthoughts of technical interest primarily. In addition, this collection of studies includes treatment and prevention efforts focused on a shared topic, which is rare in child psychopathology topical collections. This juxtaposition helps illuminate some of the many considerations that could influence how maintenance effects and booster contributions might be tested. It is hoped that further work will occur that builds on these exemplary efforts.

This set of studies, as noted in the introduction (Kolko & Lindhiem, in press), focuses on two interrelated issues: maintenance of effects post-intervention and boosters as a planned method for such maintenance. Maintenance of effects beyond intervention completion has become a requisite to judge an intervention valid as more than a temporary shift in symptom level or developmental pathway (Shadish, Cook, & Campbell, 2002). However, this important criterion for judging intervention value has been given little attention theoretically or analytically (Woolcock, 2009). Similarly boosters have been valued in psychopathology intervention for several decades (Eyberg, Edwards, Boggs, & Foote, 1998; Patterson, 1974). Taken from the application of multiple medical vaccinations to help maintain disease resistance (to sustain benefits of the first intervention) the term also emanates from substance use interventions where booster refers to periodic additional intervention to prevent relapse into old habits (e.g., additional contact and/or specific skills useful for an anticipatable challenge after a given period past first abstinence; Dijkstra, Mesters, DeVries, van Breukelen, & Parcel, 1999). These two related but not simply duplicative conceptions of boosters can be seen in the studies in this collection and across the relatively slim literature focused on boosters in psychosocial intervention for child psychopathology. For example, in some cases the intention is that boosters are an additional substantive intervention meant to maintain differences achieved by end of intervention if not to enhance effects (Tolan, Gorman-Smith, Henry, & Schoeny, 2009). In other cases, it is meant to be a limited contact

to manage exceptional challenges, greater risk of some participants, or anticipatable threats to maintaining gains (Kolko, Lindhiem, Hart & Bukstein, in press).

This special section provides much needed consideration, often through experimental tests, of the benefits of boosters as a form of intervention maintenance. While the results provided from these rigorous test provided in this collection suggest boosters may have inconsistent and modest importance in maintaining effects, the set of studies helps show how more careful thought about intervention maintenance expectations can be incorporated into research and that there are several ways boosters might be applied (Donaldson & Lipsey, 2006). Such consideration may be necessary before much more than the most tentative conclusions can be made about what maintenance of intervention effects or lack there of means, whether including a booster or not.

Maintenance and Boosters as Theorized Components of Intervention Effects and Analyses

The present set of papers join a slim number of others that explicitly test effects on maintenance and in some cases of application of a booster. For example, some of the studies here experimentally compare booster exposure to non-exposure (e.g. Kolko, Lindheim, Hart, & Bukstein, in press; Lochman, Baden, Boxmeyer, Powell, Lixin, Slaekin, & Windle, in press). Such approaches bring many advantages for understanding if adding a booster affects maintenance. However, comparisons reveal a subtle but potentially important issue that effects may depend on when and for whom assignment to booster is made. Reports here include testing the approach that boosters are useful to all (e.g., Eyberg, Boggs, & Jaccard, in press) and testing boosters as shoring up effects for those failing or at risk to fail to maintain initial effects (e.g., Dishion, Brennan, Shaw, McEachern, Wilson and Jo, in press). These differences in conception of booster role and applicability should affect how effects are tested.

One question is when is the proper time for randomization for testing boosters. Some have argued that there is need to randomize for booster tests prior to the initial intervention assignment as the intervention effects might be confounded with booster effects (Woolcock, 2009). For example, if those who are least reactive to the intervention tend to complete the intervention then the booster test is applicable to only those who benefit most from the intervention. If assignment is made prior to the intervention, this is incorporated into the initial intent to treat. Others randomize at or after completion of the initial intervention as the interest is for effects on those who completed the intervention. If the assignment is prior to intervention then generalization is for booster exposure irrespective of need and if it is based on post-test functioning then effects found for the booster are interpretable only as reflecting the particular inclusion criteria used. It will be difficult in the latter case to differentiate nonresponse to the intervention, lapsing post-intervention, or relatively poorer delivery of the initial intervention as the reasons for apparent need for the booster. Either choice leaves incomplete understanding of the potential role of boosters.

Another issue arising in this set of papers and noteworthy for interpreting results is the extent to which the booster is meant to be an automatic programmed additional dose of

intervention or is conditional based on either initial outcome benefits or functioning at some point post intervention (see Dishion, Brennan, Shaw, McEachern, Wilson and Jo, in press). When booster eligibility is conditional on functioning post-intervention, whether by self-selection (client makes self-determination as the basis for access to booster) or by objective criteria (an assessment of need is basis for booster access), there is an almost inevitable confounding of booster exposure and level of functioning. This can make it difficult to validly render a scientific understanding of the booster impact. Some reduction of uncertainty can be gained by randomizing exposure to the booster of those qualifying and using strict criteria for qualification for inclusion. One promising technique for addressing these issues of assignment being determined post-intervention is the propensity matching approach demonstrated in Dishion et al. (in press). However, perhaps more important than the technical concern of confounding, is noting that this is an example of organization of booster access is a theoretical consideration that should emerge from formulations about what the purpose and content of the booster should be, how maintenance of effects is expected to occur post-intervention (e.g. growth pattern expected), and what is expected impact of booster on initial differences.

One such theoretical issue is the role of family emphasis in booster use in child psychopathology intervention. One study among this collection focuses specifically on family engagement as the method for intervention effects (Dishion et al., in press) while two others focus on family management of the child's symptoms and focuses the booster on functioning and/or circumstances and challenges that might impede that management (Kolko et al., in press, Eyberg, et al., in press). The fourth focused booster efforts on the child and not the family (Lochman et al., in press). However, Lochman et al (in press) interpret the limited effects perhaps being due to not emphasizing family as a context and primary influence on child development. Other similar studies showing significant booster effects seem to all have a focus on family skills and challenges (e.g., Eyberg et al., 1998; Patterson, 1974; Tolan et al., 2009). Whether this signals family functioning and processes as particularly apt foci for booster interventions or merely reflects the centrality of families in child developmental course is uncertain. Further experimental tests such as provided by Lochman and colleagues here seem worthwhile, particularly where there might be matching of the theorized processes of maintenance to the booster focus. For example, ala Lochman et al. (in press), a study comparing a focus on family support of child coping skills to additional refresher training about use of such skills would be most helpful. Also, studies that compare different roles of family characteristics in maintenance (e.g., family risk exacerbating likely loss of gains, family processes mediating pattern of post intervention adjustment, family education and practice of role in managing psychopathology) could also provide important direction and specificity (Tolan, Dodge, & Rutter, in press). A similarly rich area for theoretical formulation and testing is a developmental understanding of post-intervention effects and the implications of that for judging maintenance, including timing and focus of boosters.

Another theoretical issue ripe for more careful study is testing booster approaches meant to "vaccinate" or bolster resilience against outcome compromising life events and circumstances versus those that are based in anticipation of developmental shifts or life experiences that might mitigate intervention maintenance. These differing conceptions of

boosters not only suggest different emphases and content but also may direct toward different targets (e.g., family management skills versus developmental adaptation of management skills as children age).

Similarly, studies of boosters organized as a specific and additional intervention not just a bolstering or securing of intervention effects are likely to be important. In some cases, a booster may be a relatively minor engagement and in others it can rival the intervention for time requirements and how it is thought to affect risk. For example, in our test of SAFEChildren, the booster was a developmentally organized second intervention, not merely some additional contact to ensure continuity of effects (Tolan et al., 2009). As boosters increase in extent of engagement and in intention to be independently affecting risk or functioning, there is greater confounding of booster exposure and dosage of substantial intervention (as noted by Kolko et al., in press).

Maintenance and Boosters Similarities and Differences for Treatment and Prevention

In addition to these implications and issues brought into focus, this set of studies is remarkable because it includes preventive and treatment intervention studies focused on the same issue, which is almost never done. In fact, it is rare to see the inclusion of these different intervention types for child psychopathology together in a collection and for discussion as a group. However, when one links treatment considerations with those of prevention, important similarities and differences emerge that help improve understanding of each as well as the topic at hand (Tolan, 2002; see Weisz, Sandler, Anton, & Durlak, 2006 for a thoughtful suggestion of the need for and issues in linkage across intervention levels). For example, both preventive and treatment efforts for child psychopathology are grounded in a developmental framework and are implemented with recognition that intervention effects and post-intervention trajectories are dependent on many contextual effects (Tolan & Brown, 1998; Weisz et al., 2006). Both can be introduced with linkage to a booster in mind and with different intents for how the booster should add to or maintain initial intervention effects. But, the two types of interventions also differ in organization and in analytic emphasis.

Treatment samples typically are recruited because all have a common set of symptoms, often at a similar level, a level constituting a clinical syndrome. All included are seen as similarly in need of and likelihood of reaction to the intervention. The focus of the intervention is typically on reducing symptom level (and in some cases functioning related to psychopathology) with expected change to occur primarily during treatment. Maintenance of treatment effects is theoretically a matter of not regaining symptom level(s). Correspondingly, the analytic approach has been to compare those who had treatment and the booster to those who only had treatment to see if at post-booster symptom level is lower for the booster than the non-booster group. Overall, the interest is in not showing significant change from post-test and in a levels or intercept comparison. More recently, this approach has been augmented in some cases with comparison that includes controls to assure that any differences take into consideration typical symptom change without the intervention.

Prevention, like treatment is aimed at immediate effects during the intervention exposure but with a focus on risk factors or pathology promoting processes thought to mitigate eventuality of the problem. The interest can be in early or mild forms of the eventual pathology or developmental and contextual factors thought to affect risk (e.g. decrease use of aggression as a means to reducing later delinquency; Lochman et al., in press). Inclusion criteria for intervention are based on assumptions about distribution of the problem across the population (e.g. universal inclusion, selective inclusion) but always with recognition that there is some heterogeneity in risk/susceptibility among those included. Not all included are expected to benefit from the intervention, as some are not in need. In practice, given the modest relation between risk factors and outcomes, most of those included in prevention for child psychopathology will not actually evince the outcome of concern (Conduct Disorders Prevention Research Group, 2013).

Prevention also differs from treatment because intervention effects may or may not be evident by the end of the intervention, even for targeted risk factors (Forgatch & DeGarmo, 1999). Ultimate effects are typically long past the intervention completion and are on different variables than those marking proximal effects of the intervention. Prevention can lower prevalence, decrease the extent of the problem eventuated, or disconnect risk factors/processes to the outcome. Each theorized effect requires different analytic modeling and as such would have different appropriate use of and tests for booster effects. Maintenance in this case may refer to lowering the rate of increase in problems or continued growth in protective factors promoted in the preventive intervention rather than a specific level effect. For example, in one of our prevention trials of SAFEChildren, which promoted parental involvement in school, our finding over time was that the program maintained parental involvement in school (a theorized protective factor) that otherwise diminishes quickly over the first few years of school in the high risk communities where the study was located. (Tolan et al., 2009). We did not boost involvement; we kept it from deteriorating. For prevention, interest is in growth patterns over time not particular levels of differences at a given point in time and certainly not simply maintaining what occurred by end of intervention (Tolan, 2002; Tolan & Brown, 1998). As there can be many theorized relations between within intervention change, post-intervention patterns of change, and linkage to outcome, theorized relations that inform analytic models used to test maintenance effects are requisite (Donaldson & Lipsey, 2006). Similarly, theorized expectations of the role of a booster for a given preventive effort and appropriate analytic modeling are needed.

Conclusions

These differences in treatment and preventive intervention when considered in light of the articles in this special section highlight some important considerations for advancing how maintenance and boosters are considered in intervention formulation and evaluation. Most prominently, the studies included and the juxtaposition of preventive and treatment studies brings into relief the need for grounding such research in a theory about intervention effects over time including how within-intervention change and post-intervention should relate. As with other aspects of intervention design and analyses in research, maintenance and boosters are expressions of theory about psychopathology and this theoretical formulation specification will inform what analytic tests are appropriate for a given case (Donaldson &

Lipsey, 2006; Shadish et al., 2002). Post-intervention maintenance and booster efforts to ensure gains made are retained are not merely afterthoughts tested to validate that effects are not temporary. They are deserving of conceptualization and research as much as the intervention proper and the basis for inclusion of participants. This special section provides an important entre toward that needed consideration.

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