Shorter communication

Computer-based dissemination: A randomized clinical trial of ePREP using the actor partner interdependence model

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ABSTRACT

The most pressing challenge facing our field is to close the gap between the need for evidence based treatment and our ability to effectively provide it. We illustrate how an empirically supported treatment can be adapted for computerized administration to maximize the likelihood of widespread dissemination. This randomized clinical trial shows how computer-based treatments can be effectively used to increase flexibility in reaching target populations. Using the actor partner interdependence model, we found that, compared to those who received a placebo intervention, ePREP participants demonstrated better mental health and relationship functioning at a six-week follow up. Those who engaged more fully in the intervention and mastered the communication techniques generally experienced superior outcomes. Implications of and recommendations for computer-based dissemination are discussed.

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Clinical science has reached a point where we can provide efficacious treatment for nearly every psychiatric condition (Nathan & Gorman, 2007). It is unfortunate and perplexing, therefore, that these empirically supported treatments are not typically used in everyday practice (Barlow, Levitt, & Bufka, 1999). As such, the most pressing challenge facing our field is to continue refining these empirically supported treatments while simultaneously finding methods of dissemination that will increase the likelihood that they will reach those who need them. To extend the reach of empirically supported treatments, researchers have begun to examine the use of computers in their delivery. Computer-based interventions have been shown to efficaciously treat a number of different disorders. For example, a meta-analysis conducted by Cavanagh and Shapiro (2004) showed that computer-based interventions could effectively treat depression, and that the patients who received these interventions saw them as a valid form of treatment.

An important illustration of this approach comes from the study of relationship dysfunction. Relationship education—the name researchers have given to interventions designed to prevent relationship dysfunction—has progressed to the point where at least eight preventive interventions have been developed and shown to be efficacious (Braithwaite & Fincham, 2009; Jakubowski, Milne, Brunner, & Miller, 2004). But two key problems face prevention

focused relationship education. First, relationship education does not optimally target those at risk for divorce and other marital problems (Sullivan & Bradbury, 1997). Second, longitudinal studies that have examined the impact of relationship education over longer spans of time suggest that the gains achieved through relationship education tend to diminish over time (Markman, Renick, Floyd, & Stanley, 1993). To address these specific limitations, a computer-based intervention called ePREP was designed as a flexible primary preventive intervention. In an initial randomized clinical trial (RCT; Braithwaite & Fincham, 2007), ePREP participants experienced improvements in problematic communication, intimate partner violence, depression, and anxiety relative to the placebo condition at an eight week follow up. Interestingly, ePREP was equally effective at improving mental health variables as an empirically supported computer-based CBT treatment included in the study. As a follow up to this study, Braithwaite and Fincham (2009) conducted another RCT where they examined the efficacy of ePREP over a longer span of time using latent growth curve modeling. In this study, ePREP was compared to a computer-based placebo intervention and participants were assessed at an eight week follow up and at a ten month follow up. A virtually identical pattern of results emerged with ePREP producing mental health and relationship functioning gains that were maintained at ten months post-intervention.

An important limitation of these studies, however, is that they were conducted with only one partner in the dyad. The present study addresses this limitation by examining the impact of ePREP for couples and in so doing is the first to use the Actor Partner

Interdependence Model (APIM; Kenny, Kashy, & Cook, 2006) in an original randomized clinical trial.

In the present RCT, we tested two major hypotheses. First, compared to placebo controls, participants who receive ePREP will experience better outcomes for relationship relevant variables. They will also experience better mental health outcomes despite the fact that ePREP does not make any mention of depression or anxiety or specific skills for dealing with their manifestations. Second, those who engage in ePREP more fully (as evidenced by comprehension of information taught in the intervention and completion of weekly homework assignments) will demonstrate greater gains on the outcome variables than those with low engagement. Similarly, those who demonstrate greater mastery of the Speaker–Listener technique presented in the intervention (as assessed by self-report and follow-up interview) will demonstrate greater gains on the outcome variables than those with low mastery. Because ePREP is designed as a preventive intervention, we did not actively seek to recruit distressed couples; rather we attempted to include a large sample of a group that relationship educators have identified as a target population; namely, college students (see Fincham, Stanley & Rhoades, in press).

Method

Participants and procedure

In the Fall of 2008, 77 couples (152 individuals) were recruited from introductory psychology and family sciences courses at a large public university. Only those who had been in a committed romantic relationship for six months or longer were invited to participate. The average age of participants was 19.92 (1.58) and the average relationship length was between 1 and 2 years and 20% of participants reported that they were currently cohabiting. The ethnic breakdown of participants was as follows: 77% White (non-Hispanic), 10% Latino, 8% Black, 3% "Mixed Race" and 2% Asian.

Before coming to the lab, couples were randomly assigned to condition using a computer generated randomization list. The ePREP condition taught empirically based methods for improving romantic relationships. The control condition taught inert information about anxiety, depression, and relationships such as definitions, prevalence rates and available forms of treatment (for more information about the content of these conditions, see Braithwaite & Fincham, 2009). Once in the lab, participants independently completed a battery of questionnaires before completing the intervention. Upon completion of their respective interventions, participants were given a paper copy of the information covered in their presentation and informed that they would be contacted by e-mail each week for the next six weeks. These e-mails directed participants to a survey that assessed their compliance with the previous week's homework assignment and provided instructions for the following week's homework assignment. After six weeks, couples returned to the lab to complete a follow-up assessment. A flowchart illustrating these procedures can be seen in Fig. 1.

Assessment

Participants were asked to complete the following measures at baseline and follow-up assessments. To assess commitment attitudes, participants completed the Dedication and Alternatives Monitoring scales from the Commitment Inventory (Stanley & Markman, 1992). The Communication Patterns Questionnaire Constructive Communication scale (CPQ) measures important patterns of communication that occur in couple relationships (Heavey, Larson, Zumtobel, & Christensen, 1996). The
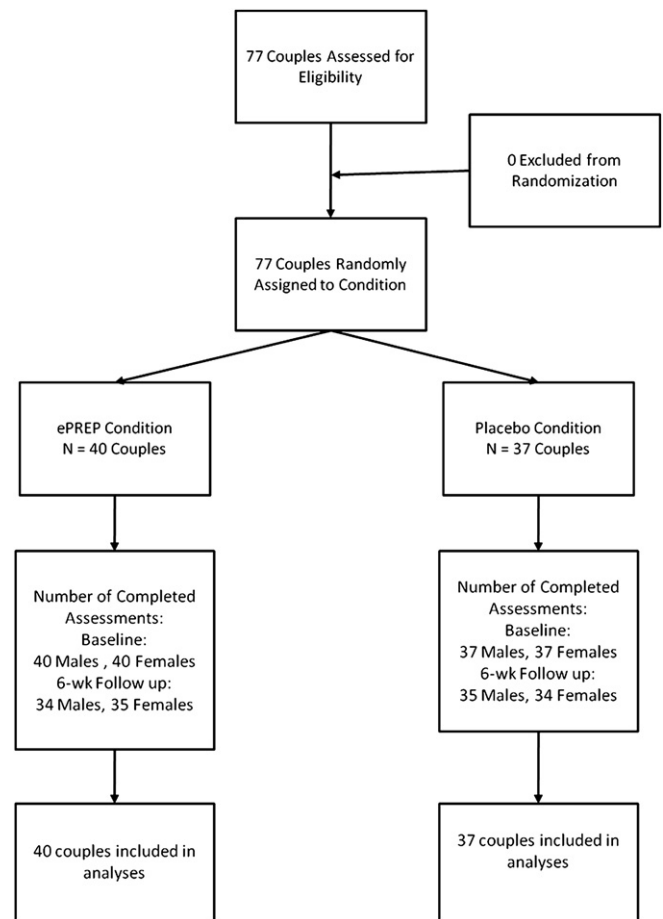

Fig. 1. Flowchart of randomized clinical trial design.

psychological aggression and physical assault scales from the Revised Conflict Tactics Scale (CTS-2) CTS-2 were used to assess how frequently these tactics were employed in the previous 6 weeks. To assess relationship satisfaction, we used the Couples Satisfaction Index (CSI; Funk & Rogge, 2007). The relationship satisfaction latent variables consisted of the four IRT derived items that comprise the CSI-4. Our depression latent variable comprised the Beck Depression Inventory (BDI; Beck, Steer, & Garbin, 1988) and the General Depression, Dysphoria and Well-being (reversed) scales from the Inventory of Depression and Anxiety Symptoms (IDAS; Watson et al., 2007). The anxiety latent variable consisted of the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) and the IDAS Panic, Social Anxiety and Trauma scales (Watson et al., 2007).

Assessment of moderators

To assess engagement we examined participants' quiz scores, weekly reports of homework completion and reports of how long participants took to complete the homework assignment. Both self-reported and observationally coded measures of mastery were used. At the follow-up assessment session, ePREP participants were videotaped using the Speaker–Listener technique and their interactions were coded by three experts who had been certified as PREP instructors. Intraclass correlations (using the Shrout & Fleiss, 1979 two-way mixed model analysis) for the three raters were .90 for males and .91 for females.

Results

Analytic strategy

The APIM was used to test the impact of ePREP relative to the placebo intervention (see Fig. 2). The omnibus test of distinguishability (I-SAT) was used to test for empirical distinguishability (Olsen & Kenny, 2006) and revealed that all of the variables examined were distinguishable by gender with the exception of alternatives monitoring, constructive communication, and self-reported physical assault. While acceptable (based on a priori power analyses), the sample size of the present study does not provide optimal power for dyadic analysis; for example, to have power of .80 for the test of not close fit for indistinguishable couples n = 2138 would be required. Under these circumstances, achieving statistical significance provides strong evidence of a robust effect (Donnellan, Ackerman & Kashy, in press). In response to these circumstances, an alpha of .10 was used and standardized effect sizes were reported to provide a clearer picture of the clinical significance of the findings. Because we used intent to treat analysis all participants were included in the analyses regardless of whether or not they completed the six weeks of the intervention and full information maximum likelihood (FIML) estimation was used to impute missing values.

Did ePREP significantly improve functioning?

As can be seen in Table 1 (in the "intervention effects" row), ePREP produced significant increases in dedication and constructive communication as well as significant decreases in alternatives monitoring, self- and partner-reported physical assault, self- and partner-reported severe psychological aggression, and depression. To provide a clearer view of the clinical significance of the intimate partner violence findings, the data were recoded to reflect six-week prevalence of any form of the intimate partner violence under investigation on the individual scales, this can be seen in Table 2. This pattern confirms what the statistical tests showed, namely that ePREP significantly reduced the overall incidence of intimate partner violence, especially for women.

Did engagement and mastery moderate outcomes?

Implementation by intervention interactions

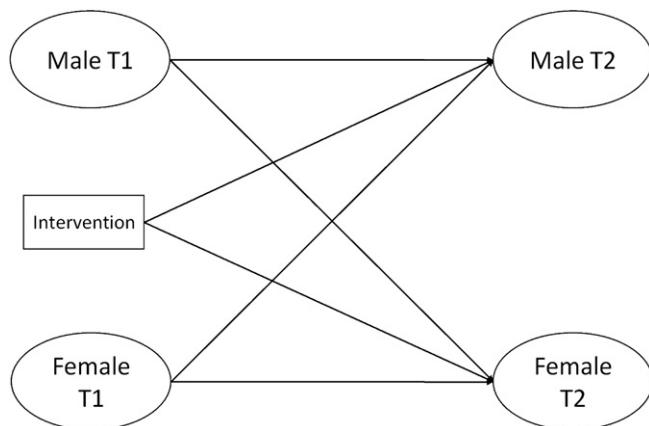Engagement in the presentation (as evidenced by superior quiz scores) produced an enhanced intervention effect for alternatives monitoring ($\beta = -.33$, p = .04), constructive communication ($\beta = .29$, p = .07), self-reported physical assault ($\beta = -.58$, p = .11), male relationship satisfaction ($\beta = .48$, p = .02) and female depression ($\beta = -.37$, p = .10). In contrast, males who engaged more fully in the computer presentation experienced an attenuation of the positive impact of ePREP on anxiety ($\beta = .35$, p = .01); perhaps this effect explains the lack of a significant positive intervention effect for anxiety.

Regarding homework completion, contrary to predictions, females who received ePREP and completed more of the weekly homework assignments experienced an attenuation of the positive impact of ePREP for depressive symptoms over time ($\beta = .45$, p = .03); this pattern—which is similar to the finding for males and anxiety—may explain the lack of a significant positive intervention effect on depression for females. These two unexpected effects likely reflect the more emotionally demanding nature of the ePREP condition, which required participants to use their newly learned communication skills each week to communicate about important and potentially "hot button" topics.

Regarding time spent completing the weekly homework assignments, those who received ePREP and spent more time completing the weekly homework assignments experienced an enhanced intervention effect for self-reported couple physical assault ($\beta = -.69$, p = .06), severe psychological aggression for males ($\beta = -.90$, p = .02) and females ($\beta = -.09$, p = .01), and male perpetrated physical assault (partner-report $\beta = -1.10$, p = .02), but an attenuation of the positive effect of ePREP on self-reported minor psychological aggression (males $\beta = .40$, p = .11; females, $\beta = .43$, p = .12). Perhaps this pattern suggests that spending more time practicing the skills each week led to more arguments that were less incendiary than before receiving ePREP.

Impact of communication skill mastery

Self-reported mastery was a less sensitive index of outcomes relative to observationally coded mastery. Self-reported female mastery predicted increased male dedication ($\beta = .11$, p = .10) and decreases in female depression ($\beta = -.29$, p = .13) and anxiety ($\beta = -.35$, p = .01). Self-reported male mastery predicted marginally significant increases in female dedication ($\beta = .17$, p = .13). Observationally coded mastery yielded a much more sensitive index of outcomes. There was a significant partner effect for observationally coded mastery such that partner mastery of communication skills predicted significant improvements in male and female constructive communication ($\beta = .27$, p = .04), alternatives monitoring ($\beta = -.26$, p = .12) and male mastery predicted increases in female dedication ($\beta = .47$, p = .10). The remaining effects are better grouped by actor and partner effects. Specifically we found that increased mastery of communication skills predicted beneficial actor effects for depression (males $\beta = -.43$, p = .03; females $\beta = -.65$, p = .01), anxiety (males $\beta = -.23$, p = .17; females $\beta = -.44$, p = .06) and self-reported assault (both genders $\beta = -.35$, p = .07). However, increased mastery predicted deleterious partner effects for depression (male partner effect $\beta = .98$, p < .01; female partner effect $\beta = .23$, p = .16) anxiety (male partner effect $\beta = .52$, p = .04; female partner effect $\beta = .18$, p = .21) and self-reported assault (both genders $\beta = .30$, p = .10). In other words, becoming a better communicator seemed to augment positive intervention effects for the actor, but to diminish positive intervention effects for the partner on these variables.

How did functioning at baseline interact with ePREP to moderate outcomes?

As can be seen in Table 3 initial scores on certain variables interacted with ePREP to moderate outcomes. The most

Fig. 2. The actor–partner independence model with intervention effects. *Note.* The paths from Male T1 to Male T2 and Female T1 to Female T2 are termed "actor effects" whereas the cross gender paths (e.g., Male T1 to Female T2) are termed "partner effects."

Table 1
Summary of data from the APIM with intervention effects models.

Label	Parameter	Dedication	Alt Monit	Rel Sat	CPQ	CTS-Aslt Part	CTS-Aslt Self	CTS-Psy Part	CTS-Psy Self	Dep	Anxiety
Main effects											
Actor effects	$M_1 \rightarrow M_2$	.95*	−.59*	.92*	.56*	.27*	.31*	Min. = .31* Sev. = .63	Min. = .21* Sev. = −.01	.48*	.25*
	$F_1 \rightarrow F_2$	.87*	−.59*	.88*	.56*	.22*	.31*	Min. = .63* Sev. = .55	Min. = .62* Sev. = .55*	.60*	.85*
Partner effects	$M_1 \rightarrow F_2$	.12	−.05	.03	.21*	−.13	.07	Min. = .05 Sev. = −.19	Min. = −.03 Sev. = −.18	.19†	.19
	$F_1 \rightarrow M_2$	.03	−.05	.20	.21*	.26*	.07	Min. = .26* Sev. = −.03	Min. = .40* Sev. = .01	.11	.27*
Intervention effects	$Tx \rightarrow M_2$	.21*	−.25†	.24	.27*	−.14	−.16‡	Min. = −.15 Sev. = −.16	Min. = .07 Sev. = −.04	−.29†	.00
	$Tx \rightarrow F_2$	.13	−.25†	.07	.27*	−.23*	−.16‡	Min. = −.17 Sev. = −.45*	Min. = −.05 Sev. = −.73*	.06	.23

*$p < .05$, ‡$p = .06$, †$p < .10$.
Note. M_1 indicates male scores at time 1, M_2 indicates male scores at time 2, F_1 indicates female scores at time 1, F_2 indicates females scores at time 2. "Part" indicates partner-report and "Self" indicates self-report.

theoretically interesting findings are presented here. For constructive communication there was a significant actor-moderated intervention effect indicating that those who already communicated well may not have benefited from more communication skills training (i.e. a ceiling effect). Turning to intimate partner violence, for self-reported severe psychological aggression, the female actor-moderated intervention effect was marginally significant ($\beta = -.56$, $p = .11$), suggesting that females who perpetrated more severe psychological aggression at baseline experienced larger decreases in this variable in response to intervention. Similarly, for partner-reported severe psychological aggression, there were significant actor by intervention interactions for males ($\beta = -.90$, $p < .01$) and females ($\beta = -.37$, $p = .03$) indicating an enhanced intervention response for those who engaged in more severe psychological aggression at baseline. In short, those who already communicated well did not become better communicators as a result of the intervention, while poor communicators (who endorsed problematic communication/conflict tactics) had an enhanced intervention response.

Discussion

This RCT used the APIM to examine the efficacy of ePREP for couples. In support of our hypotheses, we found that, compared to those who received a placebo intervention, ePREP participants experienced better mental health and relationship functioning even when accounting for the variance explained by actor and partner effects on outcome variables. In addition, those who engaged more fully in the intervention and mastered the communication techniques generally experienced an enhanced intervention response. It therefore appears that ePREP administered to couples demonstrated a more potent effect on outcomes than previous versions of the intervention. This is evidenced by the fact that gains were observed at follow up that were absent in the previously mentioned study (in which gains were generally not observed until the 10 month follow up).

In general, we found good evidence that more engagement and mastery improved outcomes. However, we found a consistent and unexpected relationship between mastery and a number of outcome variables. In short, attaining more mastery of communication skills augmented the positive impact of ePREP on one's own mental health, but attenuated the positive impact of ePREP on the partner's mental health and partner perpetrated physical assault. This finding provides evidence that for depression, anxiety and physical assault, improvements in communications skills appear to be a key mechanism in the operation of intervention effects, but these skills have different effects for the self versus the partner. It is possible that partner mastery leads to a perceived sense of superiority from the partner that causes negative feelings that lead to more mental health symptoms and a desire to lash out physically. Future research should examine whether this effect replicates and what mechanisms might drive it. In any case, this finding illustrates the desirability of appropriately analyzing dyadic data to capture subtle effects that reveal important couple dynamics.

Perhaps the most interesting intervention by couple interaction was the actor-moderated intervention effects for constructive communication which showed that couples who already communicate well might not benefit from communication based skills training, but those with the poorest communication tend to benefit most from this intervention. This finding suggests a greater need to tailor interventions to the needs of relationship education participants. Certain instruments have been developed specifically to help relationship educators identify individuals who may benefit most from relationship education and to target intervention goals for these individuals (Braithwaite & Fincham, under review). ePREP could be a powerful tool for this kind of approach to dissemination because it can be readily adapted in response to assessment data to maximize outcomes for specific couples.

Table 2
Intimate partner violence data recoded to reflect 6-week prevalence.

Sex	Variable	Time 1		Time 2		Percentage change	
		ePREP	Placebo	ePREP	Placebo	ePREP	Placebo
M	Self Rpt Phys Aslt	13.0%	16.0%	2.9%	8.6%	−78%	−46%
	Part Rpt Phys Aslt	30.0%	38.0%	14.7%	20.0%	−51%	−47%
	Self Rpt Psy Agg (m)	70.0%	75.7%	58.8%	65.7%	−16%	−13%
	Part Rpt Psy Agg (m)	72.5%	72.9%	55.9%	60.0%	−23%	−18%
	Self Rpt Psy Agg (s)	20.0%	27.0%	0.0%	17.1%	−100%	−37%
	Part Rpt Psy Agg (s)	22.5%	24.3%	5.9%	17.1%	−74%	−30%
F	Self Rpt Phys Aslt	23.0%	16.0%	5.6%	20.6%	−76%	+29%
	Part Rpt Phys Aslt	18.0%	8.0%	2.8%	14.3%	−84%	+79%
	Self Rpt Psy Agg (m)	80.0%	62.2%	66.7%	68.6%	−17%	+10%
	Part Rpt Psy Agg (m)	65.0%	62.2%	63.9%	65.7%	−2%	+6%
	Self Rpt Psy Agg (s)	17.5%	5.4%	5.6%	11.8%	−68%	+119%
	Part Rpt Psy Agg (s)	5.0%	2.7%	8.3%	5.9%	66%	+119%

Note. (m) Indicates minor psychological aggression; (s) indicates severe psychological aggression; "Self Rpt" indicates self-report, "Part Rpt" indicates partner-report.

Table 3
Actor- and partner-moderated effects and synergistic couple effects.

Moderator effects											
Label	Parameter	Ded	Alt Monit	Rel Sat	CPQ	CTS-Aslt Self	CTS-Aslt Part	CTS-Psy Part	CTS-Psy Self	Dep	Anxiety
Actor-moderated intervention effects	$M_1 \times Tx \dashrightarrow M_2$	−.19	−.19	−.45	−.30*	−.08	−.17	Min. = −.22 Sev. = −.90*	Min. = .01 Sev. = .02	−.01	−.12
	$F_1 \times Tx \dashrightarrow F_2$	−.44	−.19	−.01	−.30*	−.11	−.17	Min. = −.22 Sev. = −.37*	Min. = −.18 Sev. = −.56	.03	.55†
Partner-moderated intervention effects	$M_1 \times Tx \dashrightarrow F_2$	.17	.05	.04	−.09	.19	−.15	Min. = .00 Sev. = .04	Min. = .03 Sev. = .30	.26	.30
	$F_1 \times Tx \dashrightarrow M_2$	−.10	.05	.54†	−.09	.04	−.15	Min. = −.25 Sev. = −.08	Min. = .18 Sev. = −.02	−.15	.08
Synergistic couple effects on outcome	$M_1 \times F_1 \dashrightarrow M_2$	.15	−.04	−.02	.03	.12	−.28*	Min. = .14* Sev. = .23*	Min. = .00 Sev. = .00	−.10	.30
	$M_1 \times F_1 \dashrightarrow F_2$	.38	−.04	.35	.03	.14	−.28*	Min. = −.04 Sev. = −.03	Min. = .17 Sev. = .00	−.17	−1.63*

*p < .05, †p < .10.
Note. M_1 indicates male scores at time 1, M_2 indicates male scores at time 2, F_1 indicates female scores at time 1, F_2 indicates females scores at time 2. "Part" indicates partner-report and "Self" indicates self-report.

Regarding limitations, our sample size was small relative to the size needed for optimal power thus limiting the generalizability of our findings to a degree. We attempted to remedy this problem by increasing alpha, reporting effect sizes and using psychometrically optimized instruments (including latent variables comprised of multiple indicators where possible). In addition, to truly know the impact of this intervention, longer term follow ups are needed — ideally couples would be tracked into marriage and beyond. Further, many lower SES individuals still have limited computer access which limits the extent of the reach of interventions like ePREP. Notwithstanding these limitations, the present study extends previous research on relationship education considerably. This is the first original study to use the APIM for treatment outcomes. It demonstrates that this analytic approach is a viable and useful one for examining the impact of treatment on couples. Additionally, we used multiple informants when collecting data on intimate partner violence and mastery as well as multiple methods of assessment for assessing mastery. In addition, this is the first study to examine a number of moderators of the effect of relationship education on outcomes thus providing important information not just for this intervention, but for the wider field of skill-based relationship education.

Model for the dissemination of computer-based treatment

This study provides a useful model for the dissemination of empirically supported treatments via computer that is not unlike Weisz's deployment focused model (Weisz, Jensen, & McLeod, 2005). First, ePREP grew out of existing research on a well validated intervention, PREP (Markman et al., 1993), but was modified for computer-based administration. Many empirically supported treatments are manualized and thus the essential components of these treatments could be readily adapted for computer administration. Second, across a series of RCTs, the efficacy of ePREP was established, replicated and refined. In this step, the computer-based intervention can be evaluated after each study to determine whether some change can be made to increase flexibility or to enhance efficacy. Third, in an upcoming study, ePREP will be offered as a booster session to supplement couples therapy; specifically, a random sample of couple who recently received couple therapy will receive ePREP and their outcomes will be compared to couples who received only couple therapy. It is thought that those who receive ePREP will maintain their gains over longer spans of time. Thus in this step the intervention is employed in a practice setting, while still being refined and examined to ensure its efficacy. In following this model, the end result may be an intervention that is designed only to supplement more traditional treatment, or a well validated intervention in its own right.

There is great potential utility for flexible, efficacious and cost-effective interventions such as ePREP. In the running example of relationship education, recall that the two major problems that face relationship education are teaching populations that need it most (Sullivan & Bradbury, 1997), and sustaining the gains achieved through relationship education over time (Markman et al., 1993). ePREP provides a potential solution to these problems. Specifically, ePREP represents an empirically validated program of relationship education that can easily and cost-effectively be delivered to nearly any population. Second, ePREP is also an ideal method for delivering "booster sessions" that supplement more conventional relationship education programs, thus helping participants maintain their gains over time. Further, it represents a potentially attractive alternative for other important populations — such as couples on long waitlists, technology savvy adolescents and emerging adults, or any who have negative attitudes about face-to-face treatment — especially given its impact on both relationship functioning and mental health. Future research could profitably examine the myriad applications of this nimble intervention.

The flexibility, cost-effectiveness and versatility of computer-based treatments like ePREP infuse them with the potential to overcome many of the barriers that currently block the path to dissemination of empirically supported treatments. Put simply, there are very few places these interventions cannot go. And as society increasingly begins to inhabit virtual worlds, the demand for computer-based interventions such as ePREP will only increase. Further these virtual worlds and new technologies will provide a ready platform for delivery, if we can develop interventions quickly enough to match the demand that will exist for them. By embracing these new technologies and using them to supplement more traditional forms of delivery, the reach of empirically supported treatment will be extended considerably and the gap between the need for these treatments and our ability to provide them will continue to narrow.

Acknowledgements

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