Can Technology-Enabled, Personalized, Mental Health Supports Reduce Length of Stay and Enhance Successful Discharge in a Partial Hospitalization Program for Middle School Age Students with Mental Health Diagnoses? Preliminary Results

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ABSTRACT

The purpose of this pilot, matched-control study (N=86) was to assess the feasibility of exposing students with mental health diagnoses to a technology-based set of Social Emotional Learning (SEL) interventions tools, in order to decrease treatment days and increase the rate of positive discharges in a school-based, partial hospitalization program, thereby expediting reintegration of these students into the general school population and reducing costs of treatment. The technology-based set of interventions included a bio-feedback monitor of heart rate variability, group level, computer-based training in core social emotional competencies, and private, personalized, learner-directed, motivational counseling and skill training to address underlying reasons for distress. Pairwise comparisons of students in the treatment school with those in each of three control schools demonstrated that the technology-enhanced intervention program resulted in significantly fewer days of treatment for the experimental group ($p<.02$), and substantially higher rates of successful discharge, which did not reach the level of significance. Client Satisfaction Surveys from program administration and staff at the trial program school all rated the technology enhanced interventions at the highest level of satisfaction, reported a desire to continue use, and provided comments about ways that the technologies increased client engagement, and enhanced therapeutic relationships and efforts in a variety of ways. Student rating of their use of the technology tool was positive.

Further research is indicated to: enlarge and replicate this study, separate effects of the two technology tools, investigate outcomes at an individual versus group level, examine outcomes in terms of types of diagnosis and dosage, calculate cost benefits, assess staff, patient and family satisfaction and sustainability of practice.

KEY WORDS: at-risk youth; mental health workforce shortages, personalized social-emotional learning (SEL); educational technology; evidence based, behavioral interventions, middle school students with mental health needs.

BACKGROUND

According to a Mental Health America (MHA) 2017 report, youth mental health is worsening and there is a serious mental health workforce shortage. The statistics are staggering with 1 in 5 young people suffering from a mental illness (Mental Health America, 2017; Teen Health, 2017).

Youth with mental health issues have social, emotional and academic achievement gaps that can put them on a trajectory of further difficulties in an array of later life outcomes including school failure, lack of success on the job, successful marital and parenting relationships, and involvement with the criminal justice system. (Bruene-Butler, Hampson, Elias, Clabby & Schuyler, 1997; Kutcher & McDougall, 2009; Lipsey & Derzon, 1998).

When students' mental health issues raise to a level of "medical emergency" these students are often removed from regular school classrooms and placed in settings equipped to provide therapeutic services. Even with efforts to provide services in local communities, being separated from the general student population has stigma attached to it, which can hamper successful reintegration into school. While youth with serious issues may need to be removed from the general population to prevent disruption of the education of other students, as with medical treatment, the goal of mental health treatment programs is always to prepare patients (hereafter referred to as student clients) to re-enter a regular school setting, and reduce exclusion from the mainstream as soon as possible. Thus an optimal dose of care is one that takes the shortest amount of time to lead to a successful discharge. Successful discharge occurs when the student has completed their treatment plan and/or when symptoms are reduced to the point where a lower level of service can address their needs.

Social Emotional Learning (SEL)

Social Emotional Learning (SEL) is a rapidly expanding field of research advancing evidence-based methods for promoting social emotional competencies that are linked with success in life and in the classroom. A growing body of evidence suggests that development of social-emotional competencies can work both to address behavior problems and to promote academic achievement (Durlak & Weissberg 2007; Elias & Arnold, 2006; Fleming, Haggerty, Catalano et al., 2005; Osher, Sprague, Axelrod, et al., 2007; Zins et al., 2004).

Emotional regulation is one of the most widely recognized core social emotional competencies needed for success in school and in life (Collaborative for Social Emotional Learning (CASEL), 2015; Bandura, 2005; Gross & Munoz, 2005). The ability to calm oneself makes it easier to learn and to access other core skills such as assertive, respectful communication and higher level thinking, including solving life problems and resolving conflicts effectively (Bruene-Butler, Hampson, Elias, Clabby & Schuyler, 1997; Berking & Wupperman, 2012). In addition to behavior and critical thinking, emotions also drive perception and motivation (Izard, 2002; Mayer & Salovey, 1997).

It has been the experience of the first three authors, that while there are many effective interventions to help people learn to regulate emotion, from mindfulness, meditation, progressive muscle relaxation, and a wide range of methods for modulating "rate of breath," most at-risk adolescents with mental health issues have serious deficits in the pre-requisite skills needed to learn these techniques. They need to listen to and follow a series of instructions, refrain from over-activity, and sustain their attention

in order to learn and practice a new skill. These are all skills that adolescents with anxiety, ADHD, depression, etc. have problems with.

And yet, strengthening such core emotional competencies is often essential for patients placed in mental health therapeutic settings to successfully transition back into less restrictive settings.

To date, research demonstrates the effectiveness of a number of SEL programs, with youth under some conditions of use. (Collaborative for Academic, Social and Emotional Learning (CASEL), 2015; CASEL, 2017). However, for a substantial minority of students, exposure to universal, one-size-fits- all programs – even "model" evidence-based ones - are not sufficient to ensure school and life success. Despite forty years of SEL programming, a significant number of youth who have been exposed to evidence-based SEL programs, still fail in school, engage in delinquent behavior and suffer from mental health disorders. Health care professionals, along with educators, realize that, as with academic vulnerabilities, for these most vulnerable populations, more intensive interventions are needed.

While intensive training in core social emotional competencies is a necessary part of therapeutic treatment programs, there are inherent challenges in providing it. In addition to traditional, group-based SEL curriculum instruction, student clients with mental health diagnoses require personalized therapy and interventions goals, including a 504 plan or IEP in school settings. It is a formidable mandate for mental health professionals to deliver quality, group-based instruction in core SEL competences, while simultaneously implementing individual, personalized interventions tailored to address specific areas of distress and need. The problems are compounded and intensified in mental health settings where practitioners are dealing with a non-homogeneous population of student clients, whom no teachers in regular school settings were able to bring to success.

Youth mental health providers and schools implementing Tier 2 and Tier 3 enhanced intervention programs face challenges in keeping up with the extensive staff training usually needed to meet these mandates.

In addition, they encounter difficulties in monitoring that interventions are being delivered with fidelity and in measuring dosages (Fixen, et.al, 2005; Devaney, et.al., 2006).

Technology may offer a solution to the three-fold challenge of personalizing learning in diverse groups, reducing the training burden for mental health service providers, and automating the process of monitoring compliance and tracking dosage.

Technology is increasingly being recognized as an important tool for scaling up the dissemination of effective interventions, while providing fidelity and increasing sustainability of practice. The definition of scale up is, "enactment of interventions whose efficacy has already been established in new contexts with the goal of producing similarly positive results in larger, frequently diverse populations" (Schneider & McDonald, 2007). "*In order to diffuse effective interventions to large numbers of classrooms and schools, the goal is to modify the design to retain effectiveness while reducing resources and expertise required for success. One of the most efficient and effective ways to do this is to automate as many processes as possible.*" (Clarke & Deed, 2009).

This investigation has taken two technology-based tools, each with independent strong evidence of effectiveness and positive impact on specific factors in specific settings, and combined them to see if they could add value to traditional psychotherapeutic interventions among

students with differing mental health diagnose in a partial hospitalization program.

This pilot project was designed to explore the questions:

- Can adding personalized technology support tools reduce the amount of time that student clients spend in therapeutic settings excluded from the general population, and result in more positive treatment outcomes?
- Can having technology that is personalized by treatment goals and learner-driven, selection to address topics based on their own autobiographical context and interests (including trauma) enhance outcomes?

SEL Technology Based Programs

Two technology enabled SEL tools were selected for this pilot investigation:

1) *emWave*, a bio-feedback mechanism that provides student users with personalized feedback, and game like, structured training to practice emotional regulation.
2) *Ripple Effects* learner-directed, expert system software (teen version) that delivers personalized, motivational counseling and psycho-social training in 400 areas, including the building blocks of core social-emotional competencies, and context-specific motivational counseling and problem solving, with training in a relevant set of evidence-based strategies for each challenge.

Both of these technology tools address learning needs and help respond to the challenges discussed above. Both tools automatically collect data to document compliance and monitor dosage. Both reduce the training burden on service providers. Because the content is "in the box," intervention content is standardized and delivered with fidelity. Both have engaging features that are useful for student clients that are often disengaged or non-compliant.

Both are many times less expensive than the direct provision of similar functions by mental health professionals. The two tools have unique complementary features as well.

emWave® Desktop Technology. *emWave* technology from HeartMath features a biofeedback mechanism that measures and reports, records and displays heart rate and pulse, and provides auditory coaching, and a series of games that reinforce gradual progress toward achieving optimal levels of focus and calm. For more information see link to web site: www.heartmath.org

Ripple Effects **Behavioral Training Software.** *Ripple Effects* is a digital SEL and behavioral intervention tool designed to help personalize and scale up effective intervention delivery with fidelity, and provide sustainable social emotional learning and targeted behavioral interventions.

It uses *Ripple Effects Whole Spectrum Intervention System* (WSIS), a comprehensive expert system training platform, and a motivational counseling approach that empowers the student client to drive the learning process.

Each topic/tutorial incorporates 9-13 context-specific, differentiated modes of learning, including: Scenario-based case study; Cognitive framework; Step-by-step skill training; First person, video story-telling from youth who have dealt with the topic and learned from it; Peer Modeling video; Transfer Training practice opportunities for friends and family, Media analysis, including social media, Assisted journal writing in a structured problem solving framework; Individual profiles in a range of areas such as assertiveness, emotional regulation, impulsivity, learning styles; and game-based assessment of content mastery, where the goal is not to sort learners into winners and losers, but to use

the process of testing to bring each one to mastery.

An overview of *Ripple Effects Whole Spectrum Learning System* (WSLS) can be viewed at:

https://www.utube.com/watch?v=xOcsnUxZwo&feature=player_embedded

Both tools automatically records student dosage levels.

PURPOSE

The purpose of this real-world study was to test the feasibility of using technology-based tools to enhance psychotherapeutic interventions in a partial hospitalization program for middle-school age adolescents, in order to support their earliest reintegration into the general school population. The middle school partial hospitalization program serves youth from four counties spanning 1,200 square miles.

METHOD

Research Design

The school-level investigation was a mixed method (quantitative and qualitative) study. It included a matched-control, pairwise comparison of administrative outcomes on the impact of use of the combined *emWave* and Ripple Effects technologies, under real world conditions, without any direct involvement of program developers in delivery of the intervention. It also included a subjective evaluation of staff and student client satisfaction with the program.

We tested these hypotheses:

1) Under real world conditions in the school-based, partial hospitalization program, if given the opportunity and access to technology, students would voluntarily use both the e*mWave* (biofeedback) and *Ripple Effects for Teens* (trauma-informed, motivational counseling and SEL skill building) technologies.

2) Exposure to the technology tools would result in a shortened course of treatment compared to students with similar demographics and diagnoses in three other comparable settings under business as usual conditions.

3) Exposure to the technology tools would result in a higher rate of positive discharges than students with similar demographics and diagnoses in the three comparable settings under business as usual conditions.

4) Paraprofessional, professional and administrative staff would perceive the technology as a support that enhanced their capacity to deliver high quality service, not an additional burden or threat; 5) Students would like the program and recommend its continued use.

We also conducted a longitudinal, pre-to-post comparison of behavioral and educational outcomes between Treatment and Control Groups. That analysis and results are not yet complete, and will be reported separately.

Method of Assignment to Condition

Site selection was made based solely on one variable not at all related to the study itself: physical proximity to administrative offices. The Treatment School was chosen because of its closest proximity to administrative offices, where it would be possible for the administrator to take over classes for four 45 minute periods to allow program staff to receive training in the intervention delivery. Other sites would involve much more travel time.

Condition of Use

Treatment condition. Students participated in technology-enabled, psycho-social/SEL group sessions, utilizing projected Ripple Effects tutorials, a minimum of once a week for a 45-minute group therapy class period. Some topics were selected by staff; some by students themselves. Depending on topics being covered, up to 3 tutorials were explored during group therapy sessions that occurred daily. In addition, clients individually explored assigned Ripple Effects tutorials during individual sessions once a week, for a 45-minute period. They also were invited and encouraged to use Ripple Effects privately to explore any area of personal interest or concern.

All of the student clients received individual training in the use of *emWave* biofeedback technology and were provided with sessions to practice using rate of breath to impact heart rate variability using visual graphs of progress.

Once they learned the breathing strategy, continued practice took place during the group sessions with one student being placed on the monitor while others practiced along. This was done for 5-10 minutes during each group session and also at the start of individual sessions for students with emotional regulation goals.

Ripple Effects and *emWave* strategies were also prompted for use by staff and teacher throughout the day. Strategies were also shared with families to prompt and reinforce use of the skills being taught, in home and community situations.

Control condition. The control condition at each of three sites, was "business as usual" where student clients received academic instruction, psycho-social/social emotional learning (SEL) group sessions and individualized therapeutic sessions as a part of the Partial Hospitalization Program in three other schools. Strategies were shared with families to prompt and reinforce in home and community situations use of the skills being taught.

Setting

Physical setting. The licensed partial hospitalization program serves youth in 20 program sites spread across 1200 square miles in Pennsylvania. These program sites are based in regular schools as opposed to hospitals or clinics. This pilot study took place in four program sites that serve middle school aged students.

Technology. Both *Ripple Effects* and *emWave* technologies were installed on three computers. One instructor computer was used for projecting the technology on a Smart Board in a group setting. In addition, two computer stations with headphones and cubicles were located in a back corner of the room to allow for individual, private use of the programs.

Staffing. A special education teacher, a mental health treatment specialist and a mental health worker staff the program sites. At all sites, student clients receive academic instruction, psycho-social/social emotional learning (SEL) group sessions and individualized therapeutic sessions as a part of this program. The Mental Health Treatment Specialist (MHTS) provides these interventions with the aid and support of the Mental Health Specialist (MHS)s. Program classroom teams all have a supervising psychiatrist. As with most mental health organizations, budgets are tight and time for staff training for new interventions is limited.

STUDY SAMPLE: N = 86

Eighty-six students in four middle-school, partial hospitalization programs, all exclusively serving students with mental health diagnoses in need of mental health treatment, but whose needs could not be served in a traditional classroom setting,

participated in the study. To be eligible for participation in the program, every student must have an active Axis I diagnosis that establishes "medical necessity." Students referred to the program are assigned to the site closest to their referring school, with no other factor considered.

Students in all four middle-school

therapeutic classrooms have a similar mixture of diagnoses. The diagnoses treated at the Partial Hospitalization sites are a combination of internalizing (depression, bipolar disorder, anxiety-based disorders)

and externalizing disorders (oppositional defiant disorder, conduct disorder, ADHD). Over the last five years, there has also been an increase in the number of students on the Autism Spectrum (PDD, Asperger's Disorder). In 2013, a report that tracked commonly occurring diagnoses over a six-year period, indicated that across sites about 40% of participants had been referred for internalizing disorders, and another 40% for externalizing disorders, with most of the remaining referrals for autism-related diagnoses (Prator, 2013).

Table 1
Diagnosis Categories

Diagnosis Category	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
ADHD	17%	19%	16%	16%	16%	17%
Disruptive Disorders	25%	25%	22%	23%	20%	17%
Bipolar Disorders	19%	20%	22%	17%	17%	16%
Thought Disorders	7%	6%	4%	3%	2%	2%
Anxiety Disorders	3%	5%	4%	6%	7%	7%
Depression	21%	20%	24%	24%	26%	26%
Autistic Spectrum	6%	5%	7%	10%	10%	12%
Others	3%	2%	1%	1%	2%	2%

The practical result is that, at any given time, there are adolescents with very different diagnoses and different "best practice" treatment recommendations, all in a single, site-based group. To the degree

technology might increase capacity to personalize treatment options, hypothetically it could increase the chance of positive outcomes.

Intervention

Treatment group students participated in psycho-social SEL group sessions and individual sessions enhanced by two technology-enabled interventions:

1. *emWave* is a biofeedback mechanism that measures heart rate variability and provides learners with personalized feedback and game-like, structured training to regularize heart rate as a means of practice toward emotional regulation. It was used to help student clients recognize physical signs of emotional distress and to reinforce practice and improvement. All of the student clients received individual training in the use of emWave technology and were provided with sessions to practice controlling rate of breath to impact heart rate variability using visual graphs of progress. Once the student clients learned the breathing strategy, continued practice took place during the group sessions conducted by the MHTS who projected *emWave* technology onto a Smart Board as a part of group sessions. with one student being placed on the monitor while others practiced along. This was done for 5-10 minutes during each group session and also at the start of individual sessions for students with emotional regulation goals. All of the students were trained to log in to record their individual sessions.

2. *Ripple Effects* is expert system software that delivers personalized, motivational counseling and psycho-social skill training in 400 areas, including training in core social-emotional competencies, and context-specific problem solving, with affective and cognitive-behavioral training in a relevant set of evidence-based strategies for each challenge and context. *Ripple Effects* was used to personalize, fortify and enhance the training of core SEL skills, typically covered in SEL/psycho social groups. Highly differentiated and interactive features helped to deepen and extend training of skills typically addressed. In addition, it was used to deepen personalization of individual treatment strategies.

In group sessions, *Ripple Effects* tutorials were projected on a Smart Board as a catalyst for discussion and practice with a scope and sequence designed to address core social emotional competencies. In addition, once students were familiar with the platform, students picked topics for the group and lead the lesson/session with the MHTS as a guide on the side. Students participated in psycho-social/SEL group sessions, utilizing projected Ripple Effects tutorials, a minimum of once a week for a 45-minute group therapy class period. Depending on topics being covered, up to 3 tutorials were used during group therapy sessions that occurred daily.

In individual sessions, the MHTS used the *Ripple Effects Manual for Individualized Treatment Plans* to assign tutorials based on student clients' diagnosis and treatment plan. For every assigned topic, students were also provided time to self-select topics that they felt would be personally helpful to them. *Ripple Effects* was also used to enhance individual treatment options, by encouraging and giving student clients permission to privately go deeper into areas that student clients believe could be underneath their distress. Within their self-selected topics, they are led to training in a subset of the core social-emotional skills that are most relevant to their particular area of inquiry. Student patients utilized *Ripple Effects* during assigned individual sessions once week, for a 45-minute period. They also used *Ripple Effects* for private exploration of topics of their choice whenever time and technology was available.

Staff and teacher prompted use of *Ripple Effects* and *emWave* strategies throughout the day. Strategies were also shared with families to prompt and reinforce at home and in community situations, use of the skills being taught.

Para-professional role. A Mental Health Treatment Specialist (MHTS) conducted group sessions and helped to design individual group sessions.

Implementer training. Training and job embedded coaching took place during two, 45 minute intervals, for four sessions, and an additional follow up session two months after training. The 45-minute length of sessions was selected because this was a class period during which the Administrator could provide coverage for the Mental Health Treatment Specialist to attend (which is why proximity to the administrative office was the key site selection factor). Each of the technologies were demonstrated and practiced with the trainer during the training session. After that session, the trainer and MHTS moved to the program classroom and would introduce it to patients/clients with the trainer taking the lead the first time and the MHTS introducing it to additional patients/clients as time permitted. The Mental Health Specialist observed these student introductions and was given an assignment to practice the technologies and to introduce it to a new student.

OUTCOME MEASURES

The analysis included in this report covers two quantitative outcomes measures, and two qualitative measures of client satisfaction.

Process Measures

Typically, study and enrollment attrition would be analyzed as outcome process measures, but because Discharge Status is one of two primary outcomes, any form of leaving the program, other than through staff recommended Positive Discharge Status is believed to be a negative outcome, so to count those numbers as enrollment attrition instead, would skew the results, falsely raising positive discharge rates of the remaining students. The measure of study attrition was lack of participation in sessions where the technology was used.

Quantitative outcome measures

The two quantitative outcome measures were Successful Discharge (versus non-successful Discharge) and Length of Treatment in days.

Successful discharge rates. There are four possible kinds of discharge, of which only one is labeled "Successful." Successful discharge occurs when the student client has completed their treatment plan and/or when symptoms are reduced to the point where a lower level of service can address their needs. The not-successful alternatives are Administrative Discharge, Discharge Against Medical Advice (AMA), and simply "Unsuccessful Discharge." Interrupting treatment for summer break is not considered a discharge and has been accounted for in the model.

Length of treatment. Because of the nature of this program, length of stay is somewhat complicated. Student clients can enter the program at any point of the school year. Generally speaking, when a student's behavior or symptoms rise to the level of "medical necessity" the program is approached by school district/parent/service providers for admission to the Partial Hospitalization Program.

Admission does not coincide with the school calendar. Admission is facilitated when there is a medical need. Because admission and discharge are based on

medical needs, both can occur at any time. Therefore, length of stay is tracked in a variety of ways; calendar days, to account for absences; treatment days are also measured and number of treatment days in a particular school year. Each of these lengths of stay measures is tracked for all students or just those who have been discharged. This makes the length of stay a 3 X 2 design. All students would include those students who have been discharged during the course of the year and those students who are still enrolled. This is needed to account for the fact that by evaluating the program in June/July, some students finished the year and will be back coming back in September. In effect, their stay has not yet been completed. End of year evaluations measure where students/patients are at the end of the school year and may also be included in the following year. The program administrator calculated that the "true" Length of Stay is the one that looks at students who have been discharged and have been tracked across school years, which is the measure used here.

Qualitative Outcome Measures

Qualitative Outcome measures were staff and administrator consumer satisfaction surveys and student client interviews. Consumer Satisfaction Surveys were distributed to the program administrator, MHTS, MHS and special education teacher asking them: to rate the quality of the interventions; whether they felt the interventions should be continued; to describe the value of the interventions for them, and to make suggestions for improvement. In informal interviews, students were asked if they liked each of the technology based interventions, if they wanted to continue using them, and asked for any comments.

Data Collection

Administrative data. All schools provided student demographic data and data on treatment days and successful discharge rates. Only two of the four schools, broke down data for "not-successful" discharges into the three categories of Administrative Discharge, Against Medical Advice" Discharge (AMA) and simply "Unsuccessful Discharge" categories.

Qualitative data. Client satisfaction surveys from the trial classroom program team and administration, and interviews with student clients were collected.

Method of Analysis

Pairwise comparison was made between the Treatment School outcomes and outcomes at three other partial hospitalization programs in middle schools in the area, and between the treatment schools and the pool of all three other schools combined. All statistical analyses were performed using R Version 3.4.0 under the RStudio platform Version 1.0.143. For numeric variable comparison, simple two-sample t-tests were performed with unequal variance assumptions. For sample proportion calculations, simple two sample proportion tests were used. For categorical variable comparison, simple Chi-square test for independence were used. A p-value less than or equal to 0.05 was considered statistically significant.

The Successful Discharge Rate is defined as the number of successful discharges divided by the number of subjects in the Intent-to-Treat (ITT) sample. (See discussion above on how treatment days were calculated; the same rationale was used to determine ITT for this sample). The Intent-to-Treat calculation is used as a sensitivity analysis because two of the schools reported only successful discharges. Using ITT is a more conservative measure.

OUTCOMES

Process Outcomes

      Enrollment attrition.
Theoretically, discharge against medical advice or administrative discharge could be considered an attrition measure, however, since a primary outcome measure is Successful Discharge, enrollment attrition rates prior to successful discharge are instances of not-successful discharge that need to be included in the comparative analysis

      Study attrition. Since this was a mandated program in a controlled setting, there was no study attrition.

      Technology use. No technology-related barriers to use arose during the intervention or testing

Baseline Equivalence

      Diagnosis. Baseline equivalence is primarily established by the fact that all students in the study have met the criteria of "medical necessity" for admission into the partial hospitalization program, and all schools have the same staffing patterns and the same Business as Usual treatment modalities.

      Demographics. Demographic characteristics such as age, gender, and race of the students from a particular school have been tested for independence to verify students across schools are similar enough for comparison purposes. The set of control variables included age, gender, race/ethnicity and educational status.

      The average age of participant for each school was between 12 and 13 years of age, with the range being from nine to 15. The between-site differences in age were not significant as seen in the table below, although CG school #2 with the oldest mean age, had a p value of .061, making it the closest to significantly different from the TG school.

Table 2
Mean Age Distribution Across Sites

School	Age	Range	Avg (as of 6/15/2016)	Compared to	t-stat (p-value)
TG Middle School	12.65	10.37-14.99	13.19	School #1, #2, #3	0.6159
CG School #1	12.67	10.67-15.30	13.37	Nazareth	0.6508
CG School #2	13.20	11.06-14.85	13.85	Nazareth	0.0618
CG School #3	12.19	9.92-14.25	12.91	Nazareth	0.4104

Across schools, samples were weighted toward male participants. This distribution parallels the disproportionate representation of males in discipline and special education settings across the US. The between-site differences in proportional gender weighting were not significant as seen in the table below.

Table 3
Gender Distribution

School	Male	Female	Compared to	Chi-square (p-value)
Treatment Group Middle School	17 (74%)	6 (26%)	CG schools #1, #2, #3	0.3636
CG School #1	11 (55%)	9 (45%)	TG school	0.3285
CG School #2	12 (63%)	7 (37%)	TG school	0.6780
CG School #3	15 (62.5%)	9 (37.5%)	TG school	0.5988

Overall, the sample population was almost evenly dividend between white students (51%) and students of color (49%). Unsurprisingly, given housing patterns in the US, and assignment to this program based on geography, there were differences in racial/ethnic distribution of student clients between program sites. As seen in the chart below, the race/ethnicity differences were not statistically significant in a sample of this size, but may become significant with a larger sample.

Table 4

Distribution of Race/Ethnicity

School	N	Asian / Pacific Islander	Black / African American	White	Hispanic	Multi-racial	Compared to	Chi-square (p-value)
Treatment Group	23	-	1 (4%)	13 (57%)	6 (26%)	3 (13%)	CG schools #1+ 2, +3	0.2665
School #1	20	-	5 (25%)	9 (45%)	6 (30%)	-	TG school	0.1016
School #2	19	-	4 (21%)	12 (63%)	2 (11%)	1 (5%)	TG school	0.2123
School #3	24	1 (4%)	1 (4%)	10 (41%)	11 (46%)	1 (4%)	TG school	0.4278
Totals	86	1	11	44	25	5		

In terms of educational status, all participants had either an IEP, or 504 Individualized Treatment Plan. Which type of plan covered each student was not a factor in admittance into the program or in access to treatment.

Table 5
Educational Status

School	IEP	504 Plan
TG	19 (83%)	4 (17%)
CG #1	5 (25%)	15 (75%)
CG #2	13 (68%)	6 (32%)
CG #3	12 (50%)	12 (50%)

Socio-economic status data was received too late to be analyzed for this report, which was accelerated to conform to a SAMHSA deadline to be included in the first group of

new studies for programs already listed on the National Registry of Evidence-based Programs and Practices (NREPP). Both *Ripple Effects* and HeartMath *emWave* tools are NREPP listed. SES will be analyzed before publication of this article.

Primary Quantitative Outcomes
     Length of Stay (treatment days).

At 66 treatment days the TG school had the lowest average treatment days among all schools: 59% of the mean length of stay of CG # 1, 63% of Treatment days of CG school #2, and 69% of treatment days of students in CG #3. It had significantly fewer mean Treatment Days than the mean of the three comparison schools combined. The difference in rates between the TG school and the mean Treatment days for the pool of three CG schools is significant as seen in Table 6.

Table 6
Length of Stay

School	Treatment Days	Avg	Compared to	t-stat (p-value)
TG School	66.17	62.04	School #1, #2, #3	0.0299*
School #1	113.50	85.75	TG School	0.1332
School #2	81.60	82.31	TG School	0.1226
School #3	96.18	79.5	TG School	0.1893

Successful Discharges. In this Partial Hospitalization Program, Successful Discharge occurs a) when the student has completed their treatment plan, and/or b) when symptoms are reduced to the point where a lower level of service can address their needs." Analysis of rates of discharge using the Intent to Treat model indicate that the TG middle school group had clinically meaningful higher Successful Discharge rates than each and every control school, and than all the schools together, but that difference did not reach the level of statistical significance due to the small sample size, as seen in the table below.

Table 7
Successful Discharge Rates

School	ITT Successful Discharge Rate	Compared to	t-stat (p-value)	ITT t-stat (p-value)
TG Middle School	0.6521	School #1, #2, #3	0.8917	0.1438
School #1	0.4000	TG	0.8249	0.1779
School #2	0.3684	TG	0.5061	0.1279
School #3	0.5417	TG	0.9413	0.6352

Qualitative Outcomes

100% of administrator and treatment team members rated the technology-based interventions as Excellent, and felt that they should be continued. The Administrator indicated the highest level of satisfaction in the following areas: value in terms of supporting para-professional staff in the delivery of evidence-based interventions, treatment team satisfaction in terms of increasing their ability to deliver both engaging group instruction combined and individualized in-depth training (as required by law, for an IEP or 504 accommodation plans); students' positive engagement and the relevance of the technology enhancement for students specific needs.

Specific comments included:

Administrator.

- Using the Ripple Effect, in conjunction with our therapists, maximizes the therapeutic time. Students get much more "therapy" than would be available if it were just our therapist.
- Ripple Effects changed the dynamics between the therapist and the client. In the past, the therapist would have to introduce a topic. If the client responded poorly to the message, the relationship with the therapist suffered. With Ripple Effects, the topic can be introduced and the therapist can support the reaction/response without having

ownership of the content. This has led to much more effective therapeutic relationships.

- The menu of modules is so wide in scope that there are pertinent modules for every clinical situation we encounter.
- In my opinion, the modules in Ripple Effect are extremely well-written and comprehensive.
- With most kids, the modules are highly engaging.

Mental Health Treatment Specialist.

- My student clients have looked forward to its' administration and have been able to transfer Ripple Effects and em-Wave related coping strategies into other aspect of their lives as well, including inclusionary classes, home, and community.
- My personal experience with administering Ripple Effects lessons has been extremely positive.
- My clients seem to grasp concepts better via the technology-based and visual components of these programs.
- (Student) Clients have absolutely enjoyed the program. Feedback has been positive. Client are more interested in learning/practicing skills, if there is a visual/technological component present.
- Students are also very respectful when doing the *emWave* exercises together.

For instance, when only one student is utilizing the earpiece at a time, the others follow along and conduct breathing exercise along with the client utilizing the ear piece.

- Having students get up and press buttons *(on the Smart Board),* other students are very respectful and the students helping to lead the tutorial take pride in having a leadership role.

Student Client feedback. Interview results indicated very positive Student Client Feedback. The most common student responses included; "Good," "Cool," "Fun" and "Interesting."

DISCUSSION

Significance of Findings

The data strongly supported the five hypotheses regarding the potential value of adding technology-based enhancements to a Partial Hospitalization Program for Middle School students with mental health diagnoses:

1) Under real world school conditions, if given the opportunity and access to technology, students did voluntarily use both the *emwWave* (biofeedback) and *Ripple Effects for Teens* (trauma informed, motivational counseling and SEL skill building) technologies.
2) Exposure to the technology tools did result in clinically meaningful and statistically significantly shortened course of treatment compared to students with similar demographics and diagnoses in three other comparable settings under business as usual conditions.
3) Exposure to the program resulted in a clinically meaningful higher rate of positive discharges for TG students than for CG students with similar demographics and diagnoses in the three

comparable settings, but those differences did not reach the level of statistical significance.
4) Para professional, professional and administrative staff did perceive the technology as a support that enhanced their capacity to deliver high quality service, not an additional burden or threat;
5) Students did like the program and did recommend its continued use.

These finding suggest that this combined technology-based intervention may be a scalable, sustainable, and certainly more affordable way to shorten the length of treatment, and result in a higher rates of positive conclusions of treatment for adolescents who have been diagnosed with mental health disorders. Yet more needs to be known.

Study Limitations

Sample size. Small sample size increased the possibility of both Type I and Type II errors. Clearly, a much larger replication study is needed to see if the impacts identified here hold up in a larger sample.

Causal mechanisms and pathways. Specific causal mechanisms and pathways for the positive outcomes could not be identified. The separate effects of group versus individual treatment modalities, the separate impacts of biofeedback technology focusing on physical sensations, versus psycho-social training with instructional differentiation, both in terms of learning modes and content areas need to be dismantled. The role of demographic factors in treatment outcomes could not be identified.

Missing Data. Missing data about the categories of Not-successful Discharges in two of the CG schools, resulted in the conservative assumption that all missing data

was negative, and left open the question of why students in the Control Schools were leaving the program without a Positive Discharge.

Implications

Findings on process outcomes may have promising implications for structured Partial Hospitalization or other youth-serving settings where compliance is carefully monitored. This study's findings may not be generalized to situations where use is solely a matter of student choice, nor where adult supervision is lacking. Again, future study is needed to assess this study's generalizability. The goal is to enlarge and replicate this study, separate effects of the two technology tools, investigate outcomes at an individual versus group level, examine outcomes in terms of types of diagnosis and dosage, calculate cost benefits, assess staff, patient and family satisfaction and sustainability of practice.

CONCLUSION

Student clients with mental health diagnoses, at very high risk of school failure, health problems, and life risks, achieved gains in successful discharge and reduced length of stay in a partial hospitalization program. This was accomplished through augmenting treatment as usual for social emotional learning with technology-based interventions that both student users and adult facilitators expressed really liking, making it more likely that they would sustain use. Given the high rates of mental health disorders in adolescents, the importance of social-emotional training for adolescents with mental health diagnoses, formidable mandates to personalize that training with individualized interventions

for IEP and personal treatment goals (in addition to effective group sessions), and the shortage of highly trained, culturally competent mental health professional to deliver these services, the use of flexible technology-based tools that can at once ensure instructional fidelity, personalize this area of training in a therapeutic setting, and make it more effective and efficient, is an important and promising area for continued research. Much remains to be known. The growing rates of mental health disorders among children and youth adds a great sense of urgency to the task.

REFERENCES

Bandura, A. (2005).
The primary of self- regulation in health promotion**.** *Applied Psychology: An International Review, 54*, 245-254.

Berking, M. & Wupperman, P. (2012). Emotional Regulation and Mental Health: Recent Findings, Current Challenges, and Future Directions. *Current Opinion in Psychiatry,* 25, (2) March. 128-134. Retrieved from **www.co-psychiatry.com**

Bruene-Butler, L., Hampson, J., Elias, M.J., Clabby, J.F., & Schuyler, T. (1997). The Improving Social Awareness-Social Problem Solving Project. In G.W. Albee & T.P. Gullotta *Primary Prevention Works* Thousand Oaks, CA. Sage Publications, Inc.

Clarke, J. Dede, C. (2009). Design for Scalability: A Case River City Curriculum. *Journal of Science* Educati*on Technology*. 18:353-356. D01 10/1007/s10956-009-9d156-4.

Collaborative for Academic, Social and Emotional Learning (CASEL). (2015). *2015 CASEL Guide: Effective Social and Emotional Learning Programs-Middle and High School* Edition. Chicago, IL., Author.

Collaborative for Academic, Social and Emotional Learning (CASEL). (2017). *SEL Impact.* Retrieved from http://www.casel.org/impact / May 16, 2017.

Devaney, E., O'Brien, M. U. Resnik, H., Deister, S., & Weissberg, P. (2006). Sustainable schoolwide social and emotional learning (SEL): Implementation guide and tool kit. Chicago, IL: Collaborative for Academic, Social, and Emotional Learning.

Elias, M. J., & Arnold, H. (2006). *The educator's guide to emotional intelligence and academic achievement: Social-emotional learning in the classroom*. Thousand Oaks, CA: Corwin Press.

Fixsen, D.L., Naoom, S.F., Blase, K.A., Friedman, R.M. & Wallace, F. (2005). *Implementation research: A synthesis of the literature.* Tampa, FL: University of South Florida, Louis de la Parte Florida Mental Health Institute, The National Implementation Research Network (FMHI Publication #231).

Fleming, Haggerty, Catalano, Harachi, Mazza, & Gruman. (2005). Do social and behavioral characteristics targeted by preventive interventions predict standardized test scores and grades? *Journal of School Health, 75*(9): 342-349.

Gross,J.J., Munoz,R.F. (2006). Emotional Regulation and Mental Health. *Clinical Psychology: Science and Practice* Vol 2, Issue 2: 151-164.doi: 10.111/j.1468-28-2850. 1995.tb00036.x

Izard, C.E. (2002). Translating emotion theory and research into preventative interventions. *Psychological Bulletin, 128, 796-824.*

Individuals with Disabilities Education Improvement Act of 2004 (Public Law 108- 446).

Kutcher, S., & McDougal, A. (2009). Problems with access to adolescent mental health care can lead to dealings with the criminal justice system. *Pediatrics & Child Mental Health*, 14(1) m 15-18.

Lipsey, M.W., & Derzon. J.H. (1998). Predictors of violent or serious delinquency in adolescence and early adulthood: A synthesis of longitudinal research. In R. Loeber & D.P. Farrington (Eds.). *Serious and violent juvenile offender0s: Risk factors and successful interventions*. Thousand Oaks, CA: Sage.

Mayer, J.D. & Salovey, P. What is emotional intelligence? In P. Salovey & D. Sluyter (Eds*). Emotional development and emotional intelligence: Educational Implication*s, (pp.3-34). New York: Basic Books. Mental Health America (May 5, 2017). *The State of Mental Health in America 2017.* Retrieved from www.metalhealthamerica.net/issues/state-mental-health-america

Osher, D. Sprague, S., Axelrod, J., Keenan, S., Weissberg, R., Kendziora, K., & Zins, J. (2007). A comprehensive approach to addressing behavioral and academic challenges in contemporary schools. In J. Grimes & A. Thomas (Eds.) *Best Practices in School Psychology V* (pp. 1263-1278). Bethesda, MD: National Association of School Psychologists.

Prator, R. (2013). *Most Commonly Occurring Diagnoses in RESOLVE PHP: Six year review*. In house evaluation report, Resolve Behavioral Health, Colonial Intermediate Unit 20, Easton, PA.

Ray, A. (2009). *From Multidisciplinary Theory to Multimedia SEL interventions: The Conceptual Underpinnings of Ripple Effects Whole Spectrum Intervention System*. San Francisco: Ripple Effects.

Schneider, B. & McDonald, S.K. (Eds.) *Scale up in Education: Ideas in Principal (Vol. 1)*. N.Y. Rowman and Littlefield**.** Teen Mental Health (2017). Mental Disorders. 1-2. (downloaded May 4, 2017).

Zins, J. E., Weissberg, R. P., Wang, M. C., & Walberg. H. J. (Eds.). (2004). *Building academic success on social and emotional learning: What does the research say***?** New York: Teachers College Press.