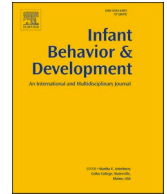




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The Welch Emotional Connection Screen: Adapting observational methods to pediatric primary care via resident training

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ABSTRACT

The Welch Emotional Connection Screen (WECS) is a novel instrument that is a brief, practicable, evidenced-based observational screening tool for assessing relationship health between parent and child. The WECS requires observing 2–3 min of face-to-face interactions between parent and child, without toys, prompts, paradigms or technology. Here, we describe a translational project from the coding lab to the primary care provider via a residency training program conducted with 50 residents during a 30-day developmental and behavioral pediatrics medical resident education rotation. The aims of this study were to evaluate the efficacy of WECS pediatric resident training: 1) to improve residents' accuracy in recognizing the dyadic behaviors of emotional connection (EC) via WECS training; and 2) to improve residents' attitudes, self-efficacy, and perceived professional norms (ASPPN) pertaining to Early Relational Health in Pediatrics. Results indicate that using a rapid prototyping approach to training, residents improved in their identification of dyads showing low to midrange levels of emotional connection. As well, resident attitudes about the importance of relationship health in pediatrics and their self-efficacy in identifying emotional connection improved significantly after this brief resident training.

1. Introduction

Early identification of mother-infant relationship health is of critical importance for preventing an array of developmental problems for both infant and mother (Hane & Fox, 2016; McFarlane et al., 2010; Welch, 2016). Applying basic developmental science to pediatric care opens the door to increased opportunity to reach vulnerable populations (Garner et al., 2012). In order to reach the primary care setting, pediatricians need a practicable tool so that relational health can be assessed rapidly in the clinical setting. The

Abbreviations: ASPPN, attitudes, self-efficacy, and perceived professional norms; DBP, developmental and behavioral pediatrics; EC, emotional connection; FNI, Family Nurture Intervention; IRB, Institutional Review Board; NSP, Nurture Science Program; RP, rapid prototyping; WECS, Welch Emotional Connection Screen; WECS-PRT, WECS pediatric residency training program.

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Welch Emotional Connection Screen (WECS) offers a novel, actionable approach for assessing and improving early parent-child relationship health (Hane et al., 2019). Here, we studied rapid prototype (RP) training on the WECS instrument in a pediatric primary care resident training program. The aims of this study were to evaluate the efficacy of WECS pediatric residency training: 1) to improve residents' accuracy in recognizing the dyadic behaviors of emotional connection (EC) via WECS training and 2) to improve residents' attitudes, self-efficacy, and perceived professional norms (ASPPN) pertaining to Early Relational Health in Pediatrics.

Our translational approach, moving from laboratory assessments to clinical practice, represents a critically important direction in the field of behavioral development—one that makes use of observational methodology to train pediatricians to understand and prioritize relational health in order to identify and support families at risk.

The WECS is based on EC theory (Ludwig & Welch, 2019, 2020; Welch & Ludwig, 2017a, 2017b) and provides a new lens with which to view the early socioemotional relationship of mother and infant/child based on readily observable indicators of mutual connection. Thus, the instrument opens new possibilities for developing novel strategies that will improve or overcome a disrupted socioemotional relationship. The WECS assesses readily observable behaviors: mutual capacity of the dyad to seek, achieve, and maintain proximity and eye contact, vocal and facial communication and reciprocity/sensitivity to each other's emotional communications. When observed in the absence of toys, objects and/or technology, the observer can readily assess these fundamental parameters of healthy relating and do so efficiently in a research or clinical setting.

1.1. The development and validation of the WECS

The WECS was developed as a relational health screen for mothers and children 0–5 years of age. It was first tested on a NICU population, assessing the mother-preterm infant relationship health during and after intervention with the Family Nurture Intervention (FNI; Welch & Myers, 2016). The WECS uses coding techniques that may be employed in any setting, only requiring that the mother hold the infant/child in a face-to-face position. We found that novice raters were adept at rapidly assessing EC by training them to examine readily detectable interactive behaviors between the pair, including mutual eye contact, gaze, touch, proximity, vocal reciprocity, and sensitivity (Hane et al., 2019). The ability to quickly rate EC was a central goal of instrument development. The emotionally connected pair presents as highly attracted to each other, using proximity, gaze and touch to stay connected. They also have an affectively warm facial expression and vocal tone. They respond to each other's emotional tone—be that with empathy and concern for negative emotions; or with mutual joyfulness upon gazing at each other. And the connected pair moves together in time across the modalities of gaze, touch, proximity, voice and affect, such that their connection may present as a social mirror of each other, whereby if a video is paused, or a moment in time were frozen, the pair can be found mutually engaged with only each other (Fig. 1).

In developing the WECS, we chose four dimensions that we consider to be the four vital signs of relational health, each rated separately and under the very simple direction that mother and infant/child be in a face-to-face position with no toys or other objects present. We aimed to capture the degree to which a dyad can engage with each other *and only each other in a mutual interaction*. Without distractions of cell phones, pacifiers and toys, the snapshot then reveals the pair's ability to find their way to connection with each other and stay there. The dimensions of the WECS include rating the dyad for the following:

- *Mutual attraction*, including gaze, touch and proximity
- *Mutual facial expressiveness*, including mutuality in facial affect and expressiveness
- *Mutual affective vocal expression*, including use of vocal behavior, together with tone, to draw the pair into each other
- *Mutual sensitivity/reciprocity*, which assesses the degree to which mother and infant/child appropriately respond to and reciprocate each other's emotional expression across all modalities listed above.

A case rated high on the WECS represents one with consistent and sustained evidence of EC on these dimensions. A midrange WECS



Fig. 1. Gaze, touch and proximity underlying emotional connection in a mother-infant dyad.

score represents a variable profile of EC. For example, brief instances of connection that are not sustained, as evidenced by intermittent eye contact or mutual joy in one instance but nonreciprocal affect at others points in the observation. A low score on the WECS represents absent or very infrequent evidence of EC on these dimensions.

The WECS has been validated with a cohort of 76 preterm infants and their mothers enrolled in the first NICU cohort of FNI (Welch et al., 2012). In order to evaluate if ratings on each dimension of the WECS (rated quickly on a global scale) are valid, we first trained a team of novice coders to see if they could achieve inter-rater reliability on these WECS dimensions. We found that reliability between novice coders was achieved efficiently, with only a few training sessions required to achieve reliability (Hane et al., 2019). We also found that the global WECS dimensions rated by one team of coders were significantly correlated with the same interactions when another independent team of coders applied labor-intensive observational software to rate the proportion of time both mother and infant spent gazing 'on' the other, touching the other, vocalizing to the other, and expressing positive and negative affect to the other. Construct validity of EC was demonstrated in the same study, with high WECS scores in this sample associated with more optimal infant physiological regulation and mutual mother-infant approach-seeking behavior upon the final play episode of the still-face paradigm (Tronick, Als, Adamson, Wise, & Brazelton, 1978), relative to low EC dyads. In another validation study with mothers and full-term infants from a community sample, the WECS was rated at infant age 6 months during a 2 min face-to-face mother-infant interaction and a 5-min, toy-based, mother-infant, free-play session. Results revealed that WECS score at age 6 months in the face-to-face observation, but not the toy-based play, was a significant predictor of maternal report of behavioral problems at age 3, with highly connected dyads having mothers who reported significantly fewer internalizing and externalizing behavioral problems (Frosch et al., 2019).

The WECS is a quick screen, which is based on a short, 3-min face-to-face observation that can be done in any setting (home, laboratory, hospital, or clinic). The WECS produces observational data that is congruent with more time-consuming methods of observational coding (Hane et al., 2019) and is associated with healthier dyadic (Hane et al., 2019) and child outcomes (Frosch et al., 2019).

1.2. Applying the WECS to pediatric primary care

The WECS pediatric residency training program (WECS-PRT) was developed by a multidisciplinary collaborative, representing developmental psychology, general pediatrics, developmental and behavioral pediatrics (DBP), and child psychiatry. As the field of DBP grew out of general pediatrics, so did assessing the child within the family context – and that assessment remains a skill taught to pediatric trainees during their required DBP residency experiences. We hypothesized that the WECS could be readily adapted for use in residency training and that residents would use the WECS to shift their lens to an emphasis on EC between parent and child. In doing so it was our hope that residents would become practitioners who readily identify when a parent-child dyad need relationship-based support in order to connect and/or maintain connection with one another.

There are several factors related to the WECS observation and screen that lend themselves to translation to pediatrics. First, the transformative nature of intentional observation of the relationship, especially when stripped bare of toys, devices and milestone goals, may be a robust method for gaining buy-in from families experiencing significant hardships or who are presenting with behavioral/developmental challenges that are overwhelming and most commonly driven by goals to achieve and milestones to be met. Contrary to pencil and paper parent-report screens measuring developmental milestones and achievements, the WECS measures the state of the relationship between parent and child. Here, in the context of the WECS assessment, the task is simple, and the message is powerful—stay in proximity to your child and “interact,” “talk,” and “relate to one another” without distractions or agendas. Second, the process of conducting the observations opens the examiner/resident to sensitivity to disruptions of EC. The interactions scored in the WECS are closely related to the actions, or treatment suggestions, that the clinician could employ in low connection dyads. This allows the clinician to note disruptions in the relationship and promote repair in an interaction supplementing the physical exam.

Our collaborative discussed methods for training pediatricians in the use of the WECS. Of particular concern was whether the inexperienced pediatric trainee would be able to learn to use observational methodology. Would the trainees find it acceptable to learn a new skill that is not already in use in general pediatrics, thus learning relational health assessment ahead of their supervising physicians? Then too, would residents engage with the material and would they find the experience as transformative to their professional development as those of us working in early relational health? Finally, if residents were to achieve clinical reliability, would it require the supervision and conferencing methods required for laboratory research training, or could we adapt training methodology to suit the learner's time constraints, expectations and needs? We hypothesized that residents would be able to become skilled at use of observation via the WECS to identify the parameters of EC. Specifically, we hypothesized we could develop an effective, but brief training program using resident feedback, WECS training videos, and an iterative approach that has similarities to conferencing in behavioral coding-fidelity training. We also hypothesized that undergoing the 2-h multimedia training would alter residents' attitudes about relational health, perceived professional norms about relational health in pediatrics, and their sense of self-efficacy as competent observers of relationship health.

2. Methods

This single group, preclinical pilot study was reviewed by the Institutional Review Board (IRB) and approved with a waiver of consent, since the training program was offered to all residents in their DBP experience during the study period. The focus of the study was to observe the effects of an educational program on residents' ability to recognize problems in EC. This was intentionally “pre-clinical” and not at the bedside, as teaching the feedback, communication, and treatment approaches of early relational health are

goals for additional training. This study's specific aims were to evaluate the efficacy of WECS pediatric resident training in improving: 1) improve residents' accuracy in recognizing the dyadic behaviors of EC. 2) improve residents' ASPPN pertaining to Early Relational Health in Pediatrics.

2.1. Participants

Pediatric residents in their first year of post graduate training were recruited from the two schools of medicine in a major metropolitan area. The two residency programs complete their primary care experiences in the same clinic: the children's hospital associated with the safety-net adult hospital in an urban, underserved area. Resident demographic data were collected including information on their childcare history, educational history, prior medical experiences, and career plans such as specialization.

In the academic years 2017–2020 (ending March 2020), residents beginning their DBP rotation were enrolled consecutively. The convenience sample of 50 residents represented was diverse (nonwhite = 52%), predominantly female (76%), aged 25–29 (82%), and had no to very little experience working with children outside of the medical context (96%). Residents were enrolled during their DBP rotation, so clinical experience was distributed through the sample: 34% had completed almost a full year of residency, 26% were in their first few months of residency, and 40% were in the middle of their first year of residency (Table 1).

2.2. Procedure

Each pediatric resident beginning their required 4-week rotation in DBP was approached for enrollment during the study period, with none opting out of data collection. Prior to the training program, subjects completed a survey of ASPPN (Supplemental Table B). A set of 6 training videos of mothers and infants engaging in face-to-face interaction were derived from videos recorded in the laboratory during the original WECS validation study (Hane et al., 2019). The training set was selected by the creators of the WECS to represent a range of scores (low, midrange and high), and these training videos were coded *a priori* and selected from the WECS validity database (Hane et al., 2019). For the pre- and post- training rating sessions, videos were grouped into 3 per set to demonstrate a full range of EC scores on the WECS (EC high, EC midrange, and EC low). Residents were given 3 cases to view and rate without any training (Video Set A). After completion of this set of three videos, residents completed the training program, taught in a group session in the first week of the rotation by the DBP residency rotation attending physician who is also a reliable WECS trainer. Immediately following the training program, residents were provided time to complete ratings on a new set of 3 videos (Video Set B). They then completed their usual 4-week rotation in DBP. After the rotation, they completed a post-rotation survey (ASPPN).

Table 1
Demographic Characteristics for Pediatric Residents (N = 50).

Demographics	N	%
Sex		
Female	38	76.0
Male	12	24.0
Self-Identified Race		
African American, Afro-Caribbean, or African	11	22
Hispanic	1	2
Asian	14	28
White	21	42
Did not report	3	6
Age Category		
25 – 29 years	41	82.0
30 – 34 years	8	16.0
≥ 35 years	1	2.0
Academic Quarter		
July – September	13	26.0
October – December	13	26.0
January – March	7	14.0
April – June	17	34.0
Experience Working with Children:		
None	20	40.0
Very little	28	56.0
Some	2	4.0
Experience Raising a Child:		
None	44	88.0
Very little	5	10.0
Some	1	2.0

2.3. Training program design

Working with institutional medical education experts, we approached the design of the education program through methods of RP (Fig. 2). RP methods originate in product development and have been adapted to instructional design (Abel, 1997; Collins & De Boer, 1998). RP “involves the development of a working model of an instructional product that is used early in a project to assist in the analysis, design, development, and evaluation of an instructional innovation” (Stokes Jones & Richey, 2000). RP “encourages iterative design based on structured early feedback” from the customers, in our case the residents. We felt that a multimedia didactic experience would more consistently develop behavior-observational skills than traditional, medical-bedside teaching. Using Nurture Science Program (NSP) presentation materials, we began with a shell set of slides and selected videos from the NSP precoded library, which represented the range of EC. We presented the materials in a 2-h didactic seminar to groups of 2 residents per improvement cycle. As we were teaching, we solicited immediate feedback on the residents’ understanding and adjusted the education program to address the gaps discovered qualitatively. When presented new information, residents were asked prompts such as, “What did you understand from that slide,” or “what do you see in that video?” Broad questions were also included to have the residents imagine how to help future learners achieve content mastery sooner. We supplied different text, charts, videos and ideas based on their suggestions and feedback. A challenge but eventual benefit, however, was that with ongoing improvement cycles we were presenting our model to different residents with different needs. Unlike quality improvement methods, RP does not require a baseline and is suited for efficiently improving an educational program prior to quantitative study of the program’s effects on learning. The residents who underwent the initial 4 RP feedback cycles, as featured in Fig. 2, are not included in the data presented here, as substantial changes were made to the training program throughout this iterative approach.

2.4. Measures

2.4.1. Expanded WECS training scales (Supplemental Table A)

To assess accuracy in rating videos and evaluate the RP training approach to coding, residents completed their ratings of dyads on video using expanded WECS-based rating scales. Working from the WECS, we developed 14 Likert items to cover the nuances embedded within the 4 domains of the original WECS (i.e., mutual attraction, vocal communication, facial communication, and sensitivity/reciprocity, See Supplemental Table A). The expanded rating scales were designed to train residents to specifically hone in on the key elements of EC that are embedded within the more global screening decisions involved in the WECS’ 4 dimensions. In this way, we were able to evaluate the efficacy of the training program in a systematic and detailed way. This approach was based on our earlier, residency training pilot: developed to capture more detailed WECS-related behavioral observation skills in preparation for live coding. Residents rated the 14 Likert-type items with responses of agreement/disagreement ranging from 1 (strongly disagree) to 4 (strongly agree). For the WECS domain of attraction, four items were included, such as “The pair had mutual eye contact” and “The pair appeared drawn to each other.” For vocal connection, three items were included, such as “the pair responded to each other’s vocalizations” and “their vocal responses were warm and positive.” For facial connection, residents were asked to rate four items, for example “when one smiled the other returned the smile” and “the pair’s facial gestures reflected deep care, joy, and warmth.” Residents rated sensitivity across three items, e.g., “interactions between the two were largely seamless and well-timed” and “disagreements or disruptions in the interaction were repaired.”

Key standard scores on the extended WECS were rated by the creators of the WECS for each of the 6 videos used in this study.

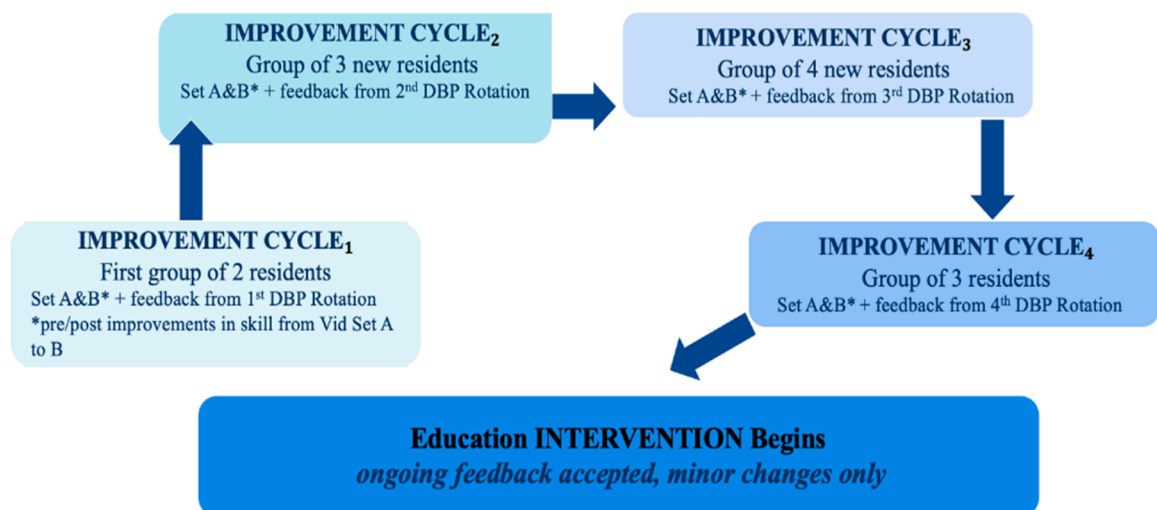


Fig. 2. Rapid Prototype Method. Through an iterative process, pairs of residents provided feedback regarding the training in each successive improvement cycle, which was used to inform the pedagogical approach in the next cycle.

Resident rating error was measured as response difference from the key score for each item, or deviation score. For each resident, deviations from their ratings and the key ratings were computed. For example, a maximum deviation from a key score of “strongly agree” would be “strongly disagree,” netting a difference of 4 for a given item. These individual rating deviations were then totaled, such that scores can range from 0 (no deviation from the key scores on any item) to 56 (maximum possible deviation from key scores on all items). Hence, a higher deviation score indicates less overall agreement with the key reference scores, and hence more rating error. A total deviation from key score was calculated for each resident, for each video and at each time point (Video Set A & B) to assess resident learning. Accuracy, or change in resident deviation scores/rating error before and after training on the extended WECS (relative to the standard/reference scores) was examined with repeated measures ANOVA and paired sample t-tests.

2.4.2. Attitudes, self-efficacy, and perceived professional norms scale (ASSPN: see Supplemental Table B)

To assess resident attitudes and perceptions about relational health in Pediatrics and their self-efficacy in identifying healthy parent-infant relationships in clinical practice, a questionnaire was administered prior to the start of training and again at the completion of DBP residency rotation. This Likert-style survey was adapted from a resident education project (Smith et al., 2015), and underwent expert review with resident educators. The Attitudes section comprised 9 items on resident attitudes towards relational health and training, Self-Efficacy contained 5 items on self-rated abilities in relational health, and PPN's 8 items queried resident beliefs about relational health's importance to peers, supervisors, and institutions (See Supplemental Table B). Each item was scored 1–5, and 5 items were reverse-scored, so that for all items a 5 represented the strongest response aligning with positive statements about relational health in pediatrics. The items within each domain were then averaged, such that a higher score represented more positive resident attitudes, perceptions, and self-efficacy. Repeated Measures ANOVAs were computed to examine change in resident attitudes and perceptions of professional norms about relational health, and self-efficacy in rating EC.

3. Results

3.1. Aim 1. Accuracy in rating

We examined rating accuracy based on the nature of the video case (e.g., high, midrange, or low EC) in order to detect resident aptitude for identifying certain kinds of cases relative to others. Accuracy for low EC and midrange EC cases is of particular clinical relevance because of risk stratification in screening: low EC cases may benefit from referral, intervention and early follow up, and midrange EC cases may benefit from careful monitoring at additional visits in the primary care setting.

As seen in Fig. 3, there was significant reduction in resident rating errors pre- to post-training, (Video Set A mean deviation = 16.99 ± 4.70 ; Video Set B mean deviation = 9.75 ± 3.67 ; $t(42) = 7.21$, $p < .001$). We probed this further by examining if accuracy in extended WECS ratings differed based on type of case coded (high, midrange, or low EC dyads). Repeated measures ANOVA comparing within subjects' (pre- and post- training) rating error (deviation scores) for the three reference levels of connectedness, produced significant effects for each factor as well as a significant interaction between the two ($F_{2,126} = 37.53$; $p = .00$; $\eta^2 = .373$).

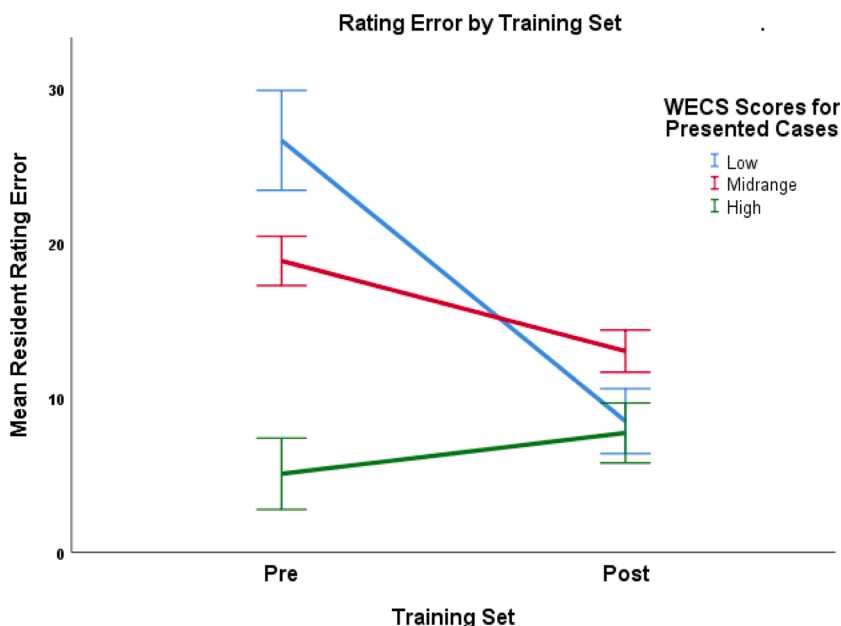


Fig. 3. Change in resident trainee accuracy scores pre- and post- residency training as reflected by lower averaged deviations from the standard reference extended WEC scores for each video. Residents showed significant accuracy after training in terms of rating dyads who had low or midrange WECS scores. No significant differences in accuracy were found for resident ratings of high EC dyads as a function of the training.

Consequently, simple effects (by level of connectedness) were computed for change in accuracy from pre- to post-training, for which effect sizes of $\eta^2 = .658$ (low connection), $\eta^2 = .434$ (midrange connection), and $\eta^2 = .032$ (high connection) examples were observed.

The significant overall effect was driven by reductions in rating error in the dyads worthy of clinical attention based on WECS scores (i.e., the EC low and EC midrange dyads). Mean rating errors were highest among the sample at baseline (set A) in the video dyad presenting low EC (26.28 ± 11.2), and significantly improved post-training to the low EC dyad in video set B (mean deviation 8.49 ± 6.84 ; $F_{(1,42)} = 80.88$, $p < .001$). Next highest in rating errors on Set A was the midrange EC dyad at 18.86 ± 5.68 , and again mean error reduction was statistically significant to video set B (mean deviation = 13.02 , ± 4.44 ; $F_{(1,42)} = 32.24$, $p < 0.001$). There was no significant change in the deviation scores/rating error for the high EC dyads from training set A (mean = 5.70 ± 8.73) to B (mean = 7.72 ± 6.31 ; $F_{(1,42)} = 1.40$, $p = .243$), indicating that residents' ability to accurately rate high levels of EC was robust at the start of training and remained relatively stable.

3.2. Aim 2. Changes in resident attitudes, self-efficacy, and perceived professional norms

As indicated in Fig. 4, residents reported significantly more positive attitudes about assessing relational health in pediatric care, $F(1, 35) = 18.09$, $p < .001$, $\eta^2 = .77$. As well, residents reported a significantly higher sense of self efficacy in their ability to identify relationship difficulties after the training program pre- to post-training, $F(1, 35) = 114.67$, $p < .001$, $\eta^2 = .91$. No significant differences were found in resident self-report of perceived professional norms about relational health.

4. Discussion

The WECS is an observational screening tool designed to assess parent-child relational health efficiently, based on a brief observation (Hane et al., 2019). The WECS has been validated for assessing EC in mother-infant samples, both preterm (Hane et al., 2019) and full term (Frosch et al., 2019). The practicality of the WECS and the simplicity of its observational paradigm were developed with a goal of clinical utility in order to provide a tool for a wide range of parent-facing professionals to assess relational health. Here we report on the development and preliminary efficacy of a residency training program, created in consultation with experts in observational methodologies and physicians, in order to evaluate the feasibility and likelihood of success in including WECS training in a pediatric residency program. This translational approach represents a lofty but important goal to shift the lens of pediatricians to view relationship health as a key indicator of developmental health. The aims of this study were to develop a pedagogical approach to resident training of observational methodology that would 1) demonstrate accuracy in resident ratings of EC using an expanded approach to WECS ratings and 2) to evaluate if this residency training was associated with change in attitudes and perceived professional norms about relational health; and resident feelings of self-efficacy in their ability to use the WECS to identify mothers and infants at-risk for a lack of EC.

For aim one, we examined if residents would achieve accuracy after an iterative RP training approach. First, RP methodology permits the education designer to efficiently achieve significant results through iterative advancements, and we were simultaneously able to improve our summative evaluation forms in preparation for our ongoing early relational health education efficacy study with the WECS. While we do exclude the $n = 8$ residents who participated in the development of the RP methodology, the efficiency in

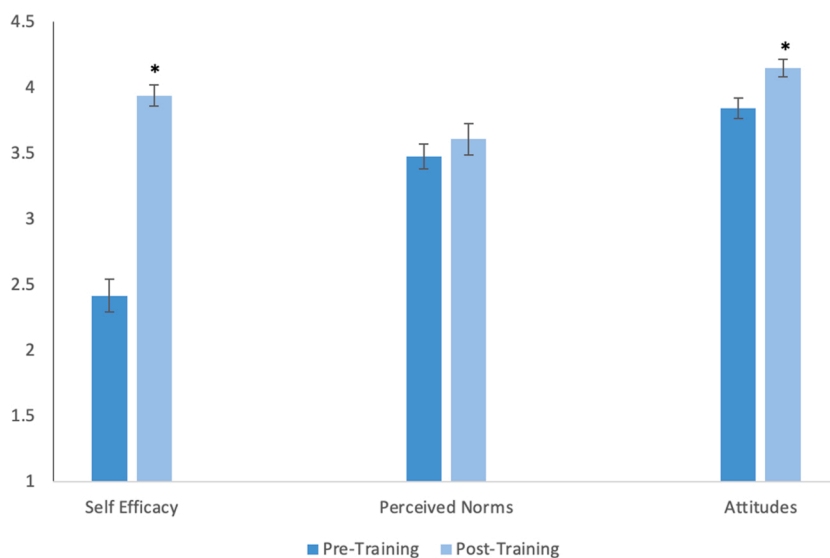


Fig. 4. Residents reported significantly higher feelings of self-efficacy and more positive attitudes about measuring relational health in clinical practice after completion of the WECS residency training program. * $p < .01$.

developing and testing the training approach brought our program to its final product version quickly. The first phases of this RP methodology were critical to quickly determining what was feasible and the most optimal training approach. Notably, residents remained accurate at rating cases that were high in EC. This is consistent with the saliency of EC, when present—when a dyad is connected, it is readily detectable. The WECS was developed around this; i.e., what are the key signs one can see that indicate that they are connected to each other? It is also a key point in WECS training, because the ability to see EC then serves as the foundation to teaching identification of its absence, and the EC midrange space in between. For example, “here this pair is connecting—what is different about this other (lower) dyad?” Not surprisingly, residents were not accurate at identifying the EC-low to EC-midrange dyads at baseline. However, statistically significant improvements were made in the residents’ ability to rate EC low and EC midrange dyads in video following the 2-h training. These data point to the efficacy of this training program in assisting medical residents with no expertise in behavioral coding and points to the potential of the training program for eventually identifying mother-infant dyads in clinical practice who need relationship support.

The second aim was to assess whether the WECS residency training would be associated with changes in attitudes about assessing relational health in pediatric visits. The results indicate that undergoing a brief training session in the residency rotation was associated with increases in positive attitudes about relationship health in the practice of pediatric medicine. As well, the training program was associated with residents reporting an increased sense of confidence in their ability to assess mother-infant dyads for relationship health. This is consistent with increases in accuracy in rating dyads who are not highly connected. No significant change was found in perceived professional norms around relational health. Residents tended to rate their perceptions of relational health in the field of pediatrics high both before and after training. Hence, the residents generally noted that pediatric medicine supports a focus on relational health in practice. The significant and positive shift in individual resident attitudes regarding taking on the responsibility of assessing relational health was enhanced by this training. WECS training may lead pediatricians-in-training to shift their attitude toward incorporating relational health work into their practice because the training time was minimal and EC was readily identifiable.

A number of limitations exist in this pilot, preclinical study. The first is that this was a convenience sample of pediatricians-in-training without childcare experience. Though we were not able to compare our trainees to a control group, we feel that the post-training rating on video set B immediately following the education better explains the improvement in accuracy than chance or incidental experience. The consistently low accuracy on video set A, which reflects residents beginning their DBP rotation throughout the academic medical year, suggests that relational health education is missing from other experiences in their first year of residency. Another limitation is that the effect of our training program was measured on videos of dyads and not in the clinical setting. Prior to translating this observation skill to the clinic, we must consider the implications and intimate nature of discussing the findings with families, the cultural transference possible, and the treatment options available to the families in our setting.

4.1. Future directions for clinical application of the WECS

EC is viewed as a dynamic construct. Embedded in the resident training was the theme that relationships change over time and should be monitored at each clinical visit. Disruptions in family circumstances, separations, and stress influence the capacity to connect to others in a given moment. In this way, observation and rating with the WECS avoids mistakenly equating relational risk identification with diagnostic labeling. Although *some* developmental disabilities may lead to challenges in early relational health, they may or may not be associated with lower WECS scores. However, the WECS measures a state of EC on a continuum, and the purpose is to identify opportunities for the provider to support the family’s ability to maintain EC. Rather than labeling, we considered interventions available at each visit when early relational health was found to be at risk. To that point, we have developed a WECS Toolkit of “light touch” interventions prepared especially for primary care clinicians. These include acoustic poems in short board-type books for parents to read with children with tips for the parents on increasing face-to-face engagement without disruptions and an activity card with prompts for initiating shared emotional expression during face-to-face interactions. Research is underway to evaluate the efficacy of this light-touch, highly accessible approach to intervention. In keeping with our goal of widespread use of the WECS to promote relational health, we have created a version with simple English translatable to any language (Goddard, Vanhatalo, Hane, & Welch, 2021). Work is currently underway with international partners who are able to use the WECS clinically and in research.

The results of this study point to the value of the training program and the feasibility of including WECS training in residency rotations. Moving forward, we will observe resident use of the WECS in their primary care setting and determine live-coding reliability *in vivo*. We will modify the ASPPN to assess for self-efficacy in using the WECS and WECS Toolkit and in discussing them, as we hypothesize that the pediatricians who learn to assess EC and who have a way of enhancing it, will comfortably discuss disruptions and repairs to mother-child relational health. While the aims of this study were to assess the feasibility and efficacy of training residents to rate relational health through the lens of the WECS, the overarching goal is to empower pediatrics to promote relational health. Research regarding clinical cut-off values on the WECS instrument is underway in outpatient pediatric settings and the newborn nursery of three hospitals. We have also developed a set of materials and activities, or WECS “Tool kit” that parent-facing professionals can distribute to parents in order to ensure or enhance EC. The findings of this study represent the first step in addressing the most foundational question of use of the WECS as a tool that pediatricians find feasible, valuable and one in which they feel a sense of confidence.

In conclusion, our training program occurred in two schools of medicine and across 3 academic years, covering multiple classes of residents. We found that a short training program improved resident rating of dyad interactions on prepared videos that contain simple interactions: the kinds of interactions a pediatrician could observe on entering an exam room in a health maintenance visit or “well child visit.” The training program also changed attitudes about self-efficacy for viewing relational health in primary practice. Findings

reported herein suggest that the WECS is practicable for broad dissemination in pediatric training programs, therefore expanding the physician's capacity to help numbers of mothers and children who need support for establishing or maintaining EC.

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Declaration of Competing Interest

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.infbeh.2021.101629>.

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