Supplementary Information

Family-based training program improves brain function, cognition, and behavior in lower socioeconomic status preschoolers

Table of Contents

Supplementary Methods

Participants

Participating children and their families were recruited from 11 preschool Head Start (HS) sites in the state of Oregon. All children were monolingual, native English speakers living at or below the poverty level ($22,050 / year for a family of four in 2009). Of the families reporting race/ethnicity (13% did not report or reported unknown), the majority (62%) of children reported White / Caucasian ethnicity (17%: more than one; 4%: Black/African American; 4%: American Indian). Children taking psychoactive medications or with diagnosed behavioral or neurological syndromes (e.g., epilepsy, ADHD, specific language impairment) and/or Individualized Family Service Plans were excluded from participation.

Based on teacher prescreening, letters of invitation were sent to the parents or guardians of all eligible children within a school. Parents/guardians were invited to an informational session held in the evening at their school, with dinner and childcare provided. Families who signed up to participate after the informational session were further screened to ensure they met the eligibility requirements described above and were then scheduled for pretesting.

A total of 174 three-to-five-year old children were recruited. Of these, 19 were dropped prior to random assignment because they did not meet the requirements of the study, were unable to complete pretesting, or withdrew consent. The remaining children were randomly assigned to one of three groups: Parents and Children Making Connections – Highlighting Attention (PCMC-A) and two comparison groups: Attention Boost for Children (ABC) and Head Start alone (HS-alone). After random assignment, six participating families withdrew from the study in the PCMC-A group, five from the ABC group, and three from HS-alone. These families were withdrawn due to health problems, moving out of town, or unresponsiveness to further phone or mail contacts. Thus, the final sample included 141 children, 66 in the PCMC-A intervention, 38 in the HS-alone group, and 37 children in the ABC intervention. Table S1 presents demographic information on the children in each group. There were no significant differences between groups in age, parental education, or gender distribution (all $p > .50$). Teachers could not be kept completely blind to children's random assignment condition, as children in the ABC group were pulled out during class time to receive the intervention. However, teachers were not informed by program staff about other children's participation, or assignment to PCMC-A versus HS-alone.

Families received $150 for participation in the study ($50 at the completion of pretesting and $100 at the completion of posttesting). All study procedures were approved by the University of Oregon Institutional Review Board and informed consent was obtained from all parents/guardians.

Parents and Children Making Connections – Highlighting Attention (PCMC-A)

The PCMC-A training program included both a child-directed component, as well as a family-based, parent directed component. Below, details of the child- and parent-components are described.

Child component

The child component of PCMC-A included a set of 20 small group activities (4-6 children, 2 adults) designed to address the overarching goals of increasing self-regulation of attention and emotion states. The activities targeted aspects of attention including vigilance, selective attention, and task switching. All activities were tested and developed with input from HS teachers at schools not participating in our study. In each session, children completed two to four of the activities as part of the small group.

The instructional model for the child component included a set of research-based practices: (a) the components and developmental sequence of attention (1, pg 46, 2, 3), (b) age- and individual-specific developmental needs (4), (c) the role of teacher scaffolding in learning (5), and (d) shifts from externally- to internally-mediated behavior (6). Specific techniques included multi-sensory activities, progressive instruction (i.e., guided teaching to independent practice, teacher-directed to child-directed group dynamic), and hierarchically structured activities (e.g., simple to complex, single- to multi-modal). For example, one selective attention exercise involved engaging children in activities requiring a high degree of focused attention (e.g., coloring within the lines of detailed figures) while simultaneously requiring the suppression of distractions (e.g., other children balancing balloons in the air around them). Children alternated roles such that each child was both attending and distracting in each session. A hierarchical progression in the intensity of the distractions across the intervention period provided support for children's improving attention skills. Also, focused activities and distracting activities were increasingly more similar to classroom situations to provide realistic practice for maximizing generalization. Thus, across the eight weeks, activities increased in their difficulty and level of attention demands. Activities also focused on increasing self-regulation of emotional states. For example, in "Emotional Bingo," children matched emotion words (e.g., 'happy', 'sad') with pictures of different facial expressions. This activity permitted children to learn emotional vocabulary, as well as practice recognizing emotional states using the facial expressions and body language of others as each child demonstrated a specific emotion. This practice in emotional awareness progressed to instruction in strategies for emotional communication, and eventually self-regulation in periods of emotional saturation (e.g., take a deep, "bird breath" to encourage calm, reflective actions instead of reactive actions) that were reinforced with visual cues (a "Bird Breath" poster).

Parent component

The parent component of PCMC-A was an adaptation of the evidence-based curriculum Linking the Interests of Families and Teachers (LIFT) developed at the Oregon Social Learning Center (7). The LIFT intervention was originally developed as a universal conduct disorder prevention program and emphasizes parenting techniques such as positive reinforcement of pro-social behavior, effective non-punitive limit setting, and consistent monitoring of children's behavior. The adapted LIFT intervention consisted of a scaffolded set of 25 strategies delivered in small group format (the parents of 4-6 children: 1 interventionist) to address the overarching goals of (a) family stress regulation with consistency and predictability, planning, and problem solving strategies; (b) contingency-based discipline; (c) parental responsiveness and language use with child; and (d) facilitation of child attention through explicit instruction on the development of attention and links to attention training exercises we employ with their children. Small-group instruction was supplemented with weekly support calls, during which the interventionist confirmed the correct implementation of home-practice activities, clarified instruction points, and provided family-specific suggestions in response to parents' experiences.

The instructional model for the parent component of the interventions included a set of research-based practices: (a) goal-oriented, self-directed, self-motivated, and self-reflective approaches to instruction, e.g., (8); (b) materials accommodating various learning style preferences (9); (c) incorporation of participants' life experiences to promote learning, positive self-esteem, and self-worth, e.g., (10); and (d) establishment of a cooperative learning environment between interventionist and adult learner (11). The importance of positive adult models and adult responsiveness for optimized adult-child interactions were underscored, (e.g., 12). Likewise, the intervention strategies emphasized parent awareness and self-initiated change regarding adult language models and behavioral patterns (13). For example, strategies for improving the degree to which children attended to parent language began with an activity in which parents were asked to increase their awareness of the language they used in communicating with their children. This included monitoring the proportion of positive language consisting of praise for their child, the quality of this praise (e.g., general or specific), as well as the proportion of negative language that can contribute to emotional saturation in children. This increased awareness for positive interaction was then built upon via the introduction of strategies for modifications of parent language. These strategies were designed to increase the degree to which children attend to parent speech by increasing the proportion of positive feedback as well as to increase self-confidence in the children (e.g., via the use of "specific praise" and "specific noticing") and decrease the degree of emotional saturation (e.g., via the use of "neutral words"). This initial focus on generating more positive interaction between the parent and child served an important first step in developing, or strengthening, a positive relationship such that parents could more successfully employ the more challenging strategies introduced subsequently in the eight-week intervention period. Other strategies emphasized reducing overall stress by boosting predictability for the child through an increase in consistent home routines. For example, parents were encouraged to implement structured routines and to use picture-based schedules ("success charts"), with a hierarchical progression across the intervention period from more focused routines (e.g., bedtime) to child-directed daily and weekly schedules.

The small group format was employed to provide parents with social support, a factor that has been reported lacking in families living in poverty (14). In addition to social support, this format also permitted parents to engage in active discussion with the interventionist concerning the degree of success in implementing strategies with their children, as well as to engage in role-play practice of the strategies taught in a given session, with immediate feedback from the interventionist. In addition, parents received information on the attention activities their children participated in, with suggestions for home-based modifications to provide further practice. For example, to facilitate practice of the "Bird Breath" strategy to help children cope with emotional saturation, parents were given a full-size poster like those used in the child component and encouraged to place this poster in a prominent place in the home environment as a visual cue for both parents and children to aid in awareness of emotional saturation and as a cue to use strategies for emotional self-regulation.

Procedure

The PCMC-A program emphasized parent training in small groups representing the parent/guardian figures of 4-6 HS children. Parents attended eight weekly, two-hour classes that occurred in the evenings or on weekends. Family meals and childcare were provided. PCMC-A parent training included collaborative-learning instruction techniques (e.g., direct and guided instruction, peer support, independent application), progressive instruction (i.e., guided teaching to independent practice, additive instruction points), and hierarchically structured role-playing activities (i.e., instructor demonstrated to parent-pair practice with feedback). Parents also received a total of seven weekly phone calls from the instructor between class meetings. The child-directed portion of PCMC-A included eight, 50-minute child sessions held concurrently with adult sessions in a separate room.

Comparison groups

Head Start alone (HS-alone)

Children in the HS-alone comparison group attended their regular half-day HS classes over the eight-week evaluation period. Within the half-day HS curriculum there are no special child attention training components. HS has a parent education component, but it is currently limited at the sites where this study was conducted (communication from HS staff). Family advocates (FAs) are responsible for three home visits per year, and parents are asked to visit the classrooms on two occasions over the course of a year. In addition, there are once monthly phone contacts and reminders for upcoming events such as family activity nights, which occur three to four times per year. Importantly, there is no required parent-guidance curriculum. Parent contact is primarily to share information regarding HS policies and available services. Families are given an initial survey of specific needs to help FAs target parents' interests, though no guidelines are provided in how to address those interests.

Attention Boost for Children (ABC)

The ABC program was an active control group condition that included many aspects of the child and parent components of PCMC-A described above, but delivered in a different format that placed more emphasis on the child component and less emphasis on the parent component. ABC emphasized child-directed training in small groups (4-6 children: 2 adults). Child sessions lasted 40 minutes/day, four days per week, for eight weeks, and were held as pullout sessions during the regular HS day. In order to attend the pullout sessions, children missed portions of gross motor time and/or discovery time in the regular HS day. Across the 8-week program period, parents received three small group sessions (the parents of 4-6 children: 1 interventionist) and four support phone calls, held in alternating weeks. Although the parent component of ABC included all of the same strategies as PCMC-A (see above for details/examples), this limited parent component did not allow for the same degree of in-depth instructional techniques as PCMC-A. For example, these sessions generally did not allow for role-play of strategies and techniques or extensive discussion of implementation challenges and successes. As well, parents received more information in each individual session, such that the strategies could not be scaffolded as sequentially as in PCMC-A. The three parent sessions lasted 90 minutes and were held in the evening or on weekends, with family dinner and childcare provided.

Fidelity checks

Treatment integrity of the PCMC-A and ABC interventions was evaluated by direct assessment methods (15). Both child- and parent-sessions were observed at least two times per eight-week intervention period by trained research staff. Using a fidelity checklist developed for parent or child sessions respectively, observers documented the presence or absence of a set of key intervention features related to three broad domains of treatment integrity (a) instructional approach, (b) instructor affect and rapport, and (c) content of lessons. For each feature observed, a value of "1" was assigned if it was present, and "0" if it was absent. The total fidelity score was equal to the total number of observed features divided by the total possible number of features. Overall fidelity ratings were very high for both parent- and child-focused sessions in both interventions: Child sessions (92.1% ABC, 95.8% PCMC-A) and Parent sessions (99.4% ABC, 95.4% PCMC-A). Individual session fidelity ranged from 79-100%. There were no differences in treatment fidelity ratings between the two interventions (M_{ABC} = 95.7%, $M_{PCMC\text{-}A}$ = 95.6%, $t(34) < 1.00$, $p = .96$).

Analysis Strategy

Multiple regression analyses were used to assess Domains 2-4[1], with post-test score as the dependent measure, and pre-test score (mean-centered) and intervention as predictors. Intervention was dummy-coded with PCMC-A as the reference group, providing direct tests of PCMC-A vs. HS-alone and PCMC-A vs. ABC. For child cognitive outcomes, age (also mean-centered) was entered as an additional predictor. Interaction terms, used to test homogeneity of regression coefficients, did not improve model fit and were thus dropped from analysis for all outcomes[2].

Table S2 presents the raw pre-test and post-test scores for all measures, separately for the PCMC-A, HS-alone, and ABC groups. The table also indicates the number of participants with complete data for each variable.

In addition to the standard regression output provided in tables, Cohen's *d* was calculated to provide a more readily interpretable effect size measure for the effect of intervention type. Cohen's *d* was calculated as the difference of the covariate-adjusted post-test means divided by the pooled standard deviation of post-test scores, separately for the PCMC-A vs. HS-alone and PCMC-A vs. ABC comparisons. Positive values indicated a larger post-test mean for the PCMC-A condition. Tables S3-6 present the complete results from all regression analyses on the measures described in detail below.

<u>Domain 1: Electrophysiological (ERP) assessments of selective attention</u>

We used the same spatial selective auditory attention ERP paradigm used in our previous studies of elementary- and preschool-aged children (16-18). Figure S1 shows a schematic representation of the ERP paradigm. Briefly, in this paradigm, children were cued to attend selectively to one of two simultaneously presented children's stories differing in location (left/right speaker), narration voice

---

[1] Details of ERP analysis (Domain 1) are discussed below.

[2] The one exception to this was the Parenting Confidence measure, where adding the interaction terms significantly improved model fit ($p < .004$). Both individual interaction terms were significant and were thus retained in the final model reported.

(male/female), and content. ERPs were recorded to 100 msec probe stimuli embedded in stories when attended and unattended. Half of the probe stimuli were linguistic (a CV syllable) and half were non-linguistic (a broad spectrum buzz). The linguistic probe was the syllable /ba/, spoken by a female speaker (different from the story narrators, described below), and then digitized and edited to 100 msec in duration. The non-linguistic probe was created by scrambling 4-6 msec segments of the /ba/ stimulus. This resulted in a 100 msec broad-spectrum 'buzz' that, while sounding non-linguistic, preserved many of the acoustic properties of the linguistic probe. We have previously shown that under these conditions of redundant attention cues and engaging stories, children as young as three years old can successfully attend selectively to one story and that the effect of this selective attention is an increase in the mean amplitude of the neural response at 100 msec to probes embedded in stories when attended (17).

Before recording data, the child heard instructions in a practice session that introduced the child to the two voices and probe stimuli. During the practice, the child received instruction on attending to a single story while ignoring the distracting story presented in the opposite audio channel. A researcher sat next to the child at all times to monitor behavior, ensure the child remained equidistant between the two speakers and did not turn to face one of the speakers, and administer comprehension questions following each story. The researcher was blind to children's treatment condition. A camera transmitted the session so other researchers and the caregiver(s) could observe from outside the booth. The child was instructed to attend selectively to one story, while ignoring the story presented in the opposite audio channel.

Within a session, children attended to a total of four narratives. The narratives were drawn from the following children's book series: *Blue Kangaroo* (19-22), *Harry the Dog* (23-26), *Henry* (27-30), *Max and Ruby* (31-34), and/or *Munsch for Kids* (35-38). Each attended story was read by a different narrator (two male / two female), with children attending twice to the story on the right side and twice to the story on the left side (start side counterbalanced across participants). For each participant, the same narrators occurred in both the attended and unattended position within a session (narrating different stories), and children attended to the same voices (but different stories) from pretest to posttest. All test conditions (attended narrator / story) were balanced across the three intervention groups, and identical probe stimuli were used in all sessions. The order of narratives was counterbalanced across pre- and posttest sessions and groups.

After each story, the experimenter asked the child three basic comprehension questions about the attended story. These questions were not designed as a sensitive assay of children's language abilities (this was the purpose of the standardized tests), but were instead included to reinforce to the child the goal of paying careful attention to a single story. The comprehension questions always had two alternatives. (A response of "I don't know" was counted as an incorrect response.) As a criterion for inclusion in data analysis, all children answered a minimum of six questions correctly per session (i.e., pre- and post-testing sessions). Detailed attrition data for the ERP domain are presented in Table S7. There were no group differences in the percentage of questions about the attended story answered correctly per session (Pre-test: PCMC-A M = 71% (SD = 1.3), ABC M = 70% (SD = 1.30), HS-alone M = 69.31 (SD = 1.3), $F(2, 64) = .156$, $p > .8$; Post-test: PCMC-A M = 73% (SD = 1.3), ABC M = 79% (SD = 1.6), HS-alone M = 78% (SD = 1.1), $F(2, 64) = 1.365$, $p > .2$)).

The electroencephalogram (EEG) was recorded from 32 scalp channels positioned according to standard 10-20 system locations. Electrodes were also placed horizontally next to each eye and beneath the right eye in order to monitor eye movements and blinks. Online, electrodes were referenced to the left mastoid (or the Common Mode Sense active electrode for BioSemi data). Offline, data were referenced to the averaged left and right mastoid. Trials contaminated by artifacts (e.g., blinks, muscle artifact) were excluded from the analyses. Data were acquired using one of two EEG acquisition systems used in previous studies (see www.biosemi.com and (18) for methodological details).

Offline, separate ERPs were averaged to the same probe stimuli embedded in stories when attended and unattended. ERPs were averaged for each subject at each electrode site over a 500 msec epoch, using a 100 msec pre-stimulus-onset baseline. Individual artifact rejection parameters were selected for each subject on the basis of visual inspection of the raw EEG to identify the smallest amplitude changes associated with eye movements or blinks. Trained research assistants, blind to the experimental condition, performed this artifact rejection. ERP data were analyzed using an ANOVA on the mean amplitude of the ERP difference score (attended – unattended conditions) from 100-200 msec post-stimulus onset, averaged over three rows of 8 electrodes (anterior: F7/8, F3/4, FT7/8, FC5/6; central: T7/8, C5/6, CP5/6, C3/4; posterior: P7/8, P3/4, PO3/4, O1/2), with step-down analyses as indicated below. The 100- to 200-msec time window used in analysis was selected based on examination of individual subject data (blind to participant group assignment) and has been used in our previous research with this paradigm (39-41).

The omnibus ANOVA included factors of group (PCMC-A, ABC, HS-alone), time (pre-, post-intervention period), attention condition (attend, unattend), and three levels of anterior/posterior electrode location (anterior, central, posterior). Greenhouse–Geisser corrections were applied for all ANOVAs with greater than one degree of freedom (uncorrected degrees of freedom but corrected p values are reported). Following omnibus ANOVAs, additional analyses were performed in step-down fashion to isolate any significant interactions, collapsing across factors with which an interaction was not found (see Tables S8-9). ERPs to the probes in the attended and unattended conditions for all electrode sites for all groups at pre- and post-test are presented in Figures S2-7.

Domain 2: Laboratory Measures of Child Cognition

Children were assessed with a battery of behavioral measures assessing aspects of cognition including non-verbal intelligence, language, and pre-literacy.

Nonverbal intelligence: Children completed the fluid reasoning, quantitative reasoning, and working memory subtests of the Stanford-Binet 5th Edition (SB-5) nonverbal IQ scale (42). Raw scores from these three subtests were averaged together to create a composite nonverbal IQ score.

Receptive language: Children completed the sentence structure and concepts & directions subtests from the receptive language section of the Clinical Evaluation of Language Fundamentals – Preschool 2nd Edition (CELF-P:2) (43). Raw scores from these two subtests were averaged together to create a composite receptive language score.

Preliteracy. Children completed three measures of early literacy and phonological awareness based on the Preschool Individual Growth and Development Indicators (44). These tasks measured initial sound matching, rhyming, and letter awareness. The sound matching and rhyming tasks were used from the Get It, Got It, Go! Series, available online (http://ggg.umn.edu, retrieved October 2004). The letter identification task required children to verbally label any letters they knew from a page of 54 uppercase and lowercase letters taken from the Observation Survey of Early Literacy Achievement (45), i.e., 26 letters in upper and lowercase forms as well as the double grapheme forms: 'a / ɑ' and 'g / g'. As each of these individual measures produced a percent accuracy measure, the preliteracy composite was created by averaging the percent accuracy scores for the three measures.

In addition, children completed a version of the lab gift delay task (46), but preliminary analysis of this measure showed strong ceiling effects, so it is not discussed further.

Domain 3: Parent and Teacher Report of Child Behavior

PKBS - The Preschool and Kindergarten Behavior Scales - Second Edition (PKBS-2). The PKBS-2 (47) was completed by the parent and teacher of each child. The PKBS-2 is a standardized behavior rating scale developed to assess social skills and problem behaviors of children ages 3 through 6 years. The items on the PKBS-2 are rated on a 4-point frequency scale (0 = never, 1 = rarely, 2 = sometimes, 3 = often). Reliability of the PKBS-2 has been demonstrated in previous research studies with preschool and kindergarten-aged children (47-49). The PKBS-2 consists of two scales: Social Skills and Problem Behavior. The social skills scale includes 34 items that describe adaptive and positive social skills including items tapping social cooperation, social interaction, and social independence. The problem behavior scale includes 42 items that describe problem behaviors, including both externalizing problems and internalizing problems.

Domain 4: Parenting

Parent Daily Report (PDR). The PDR (50) is a well-established and widely used measure of parental stress in relationship to child behaviors and was used to assess the perceived levels of caregiver stress. From the PDR checklist, 48 of the 52[3] commonly occurring child problem behaviors (e.g., hitting, biting, yelling, stealing) were queried during the telephone interviews across five consecutive weekdays (all parents had data from at least 3 days available). If a caregiver reported the target behavior occurring in the past 24 hours, a subsequent question was asked regarding whether the caregiver perceived that particular behavior as feeling stressful. The PDR assessment of caregiver stress was Total Stress, taken as the average total number of child problem behaviors for which the parent reported experiencing stress.

Caregiver Confidence & Ability. A parenting confidence and ability rating questionnaire (based on the format used by 51) was administered to evaluate perceived caregiver confidence and ability levels. Parents rated their feelings of confidence (e.g., "How confident are you in your ability to present clear and enforceable directions to your preschooler?") and ability (e.g., "What is your ability level for establishing a consistent set of house rules for your preschooler?") for select parenting behaviors using a 1- to 5-point scale. Two subscales were used for analysis: Perceived confidence, computed from eight questions related to confidence in parenting, and perceived ability, computed from eight questions related to perceived ability in parenting.

Play dyad language and interaction patterns. Functional language samples of caregivers were collected through videotaped play dyad sessions, following the procedures in (52). Briefly, during the videotaped eight-minute play task, the child/parent dyad were presented with a standard set of toys and told to "play with the toys so we can see what usually happens during shared playtime." Four categories of toys were available for all dyads: pirate ship, food, vehicles, and animals. Specific toys were purposefully included in each category to provide opportunities for parental teaching and modeling of new vocabulary and/or concepts. For instance, the pirate ship toys included items such as a navigating compass, magnifying glass, grappling hook, and dinghy boat. The final seven minutes of the play session were transcribed and coded for a set of language and interaction behaviors specifically targeted in the parent-training portion of the curriculum and described below. Data were coded by research assistants who met training criteria and who were blind to experimental condition. Four specific parent language and interaction measures were examined.

(1) Parent mean length of utterance in morphemes (MLU-m) was calculated as the average number of morphemes in each parent utterance. As parents on average begin with a larger MLU-m relative to their child's utterances (53), a reduction in parent MLU-m typically corresponds to a closer approximation of a child's overall utterance length, or "locking in" to the child's level of language use.

(2) Parent type to token ratio (TTR) was used to measure lexical diversity. TTR was calculated as the total number of unique lexical items divided by the total number of lexical items in the parent's utterances. An increase in TTR would correspond to increased lexical diversity, which has been shown to support children's vocabulary learning (54).

(3) Parent turn taking (turn taking) measured whether parent and child interactions were balanced, as opposed to parent-dominated. A balanced turn was defined as a child utterance followed by a single adult utterance, which was in turn followed by a child utterance rather than a second adult utterance. Turn taking was measured by the percent of parent utterances demonstrating balanced turn taking divided by the total number of possible utterances in which a parent could demonstrate balanced turn taking. As parents on average tend to dominate verbal interactions with their children (55), an increase in turn taking would indicate that a parent is allowing more opportunity for his or her child to contribute to the conversation.

(4) Parent language modeling was measured as the percent of utterances in which a parent repeated and elaborated on a child utterance, for example to incorporate adjectives or additional phrases. An increase in language modeling would indicate that the parent was giving more direct embedding opportunities for

[3] The four excluded items involved inappropriate defecation and/or sexualized behavior that were never observed in our earlier studies of preschool children and that some parents found offensive.

language learning in the parent-child conversation, which is believed to support language development (56).

Supplementary Results

ERP Analysis

Pre-test. Preliminary analysis examined pretest data only to confirm no differences among groups, using a 3 (Group: PCMC-A, ABC, HS-alone) x 2 (Attention: Attend, Unattend) x 3 (Anterior/Posterior: Anterior, Central, Posterior) ANOVA. This analysis confirmed that there were no significant differences among the three intervention groups (all tests involving Group as a factor, $p > .25$).

Omnibus ANOVA. A significant interaction revealed group differences in changes in early attentional modulation following training (attend-unattend x group x time x anterior/posterior, $F(4, 124) = 2.88$, $p = .045$). Follow-up analyses restricted to attended and unattended probes, respectively, indicated that differences between groups were limited to the neural response to attended probes (Attended probes only: group x time x anterior/posterior: $F(2, 94) = 5.09$, $p = .003$; Unattended probes only: group x time x anterior/posterior: $F(2, 94) = .09$, $p = .939$). Following examination of pretest data to confirm that there were no significant pretest differences in the ERP response to probes in the attend channel (all interactions with group NS), subsequent step-down analyses were conducted to directly compare changes in the neural response to attended stimuli between the PCMC-A and each of the two comparison groups. Each ANOVA included two levels of group (PCMC-A vs. ABC; PCMC-A vs. HS-alone), two levels of time (pre-, post-intervention period), and three levels of anterior/posterior electrode location (anterior, central, posterior).

PCMC-A compared to ABC. A significant interaction in the omnibus ANOVA (group x time x anterior/posterior, $F(2, 94) = 4.54$, $p = .024$) was observed, and additional step-down analyses were then performed within each group to isolate the changes in the neural response to attended stimuli across time. In the ABC group, no interactions with time were significant (all $p > .2$). In contrast, the PCMC-A group showed an increase in the neural response to attended stimuli (time, $F(1, 32) = 5.41$, $p = .027$) that was maximal over posterior electrode sites (time x anterior/posterior, $F(2, 64) = 9.67$, $p = .001$). Additional analyses within the PCMC-A group at each electrode row further isolated this change in the neural response to attended stimuli across time to posterior sites (posterior rows only: time, $t(32) = 4.70$, $p < .0005$). See Table S8 for analysis details.

PCMC-A compared to HS-alone. A significant interaction in the omnibus ANOVA (group x time x anterior/posterior, $F(2, 94) = 7.83$, $p = .003$) was observed, and additional step-down analyses were then performed within each group to isolate the changes in the neural response to attended stimuli across time. In the HS-alone group, no interactions with time were significant (all $p > .19$). In contrast, as detailed above, the PCMC-A group showed an increase in the neural response to attended stimuli (time, $F(1, 32) = 5.41$, $p = .027$) that was maximal over posterior electrode sites (time x anterior/posterior, $F(2, 47) = 9.67$, $p = .001$). Additional analyses within the PCMC-A group at each electrode row further isolated this change in the attention effect across time to posterior sites (posterior rows only: time, $t(32) = 4.70$, $p < .0005$). See Table S9 for analysis details.

Supplementary analyses including midline sites revealed a similar pattern of results (omnibus group x time x anterior posterior, $F(4, 124) = 2.85$, $p = .047$; attended probes only: group x time x anterior/posterior, $F(4, 124) = 4.87$, $p = .004$; attended probes within PCMC-A, time x anterior posterior, $F(2, 64) = 9.55$, $p = .001$; attended probes within PCMC-A posterior row, time, $t(32) = 4.59$, $p < .0005$). In addition, as the PCMC-A group had a larger number of participants (and thus greater power for detecting possible pre-post changes), an additional supplementary analysis was conducted in which the PCMC-A group was divided into two random subsets (n=17 and n=16), to match the sample size of the comparison groups. In this supplementary analysis, both subsets showed statistically significant increases in the amplitude of the neural response to attended probes over posterior channels: PCMC-A subset 1: $t(16) = -3.18$, $p = .006$; PCMC-A subset 2: $t(15) = -3.50$, $p = .003$.

Supplementary Figures

Figure S1a. ERPs from the selective auditory attention paradigm to probes in the attended and unattended stories for all electrode sites, for the HS-alone group at pre-test.

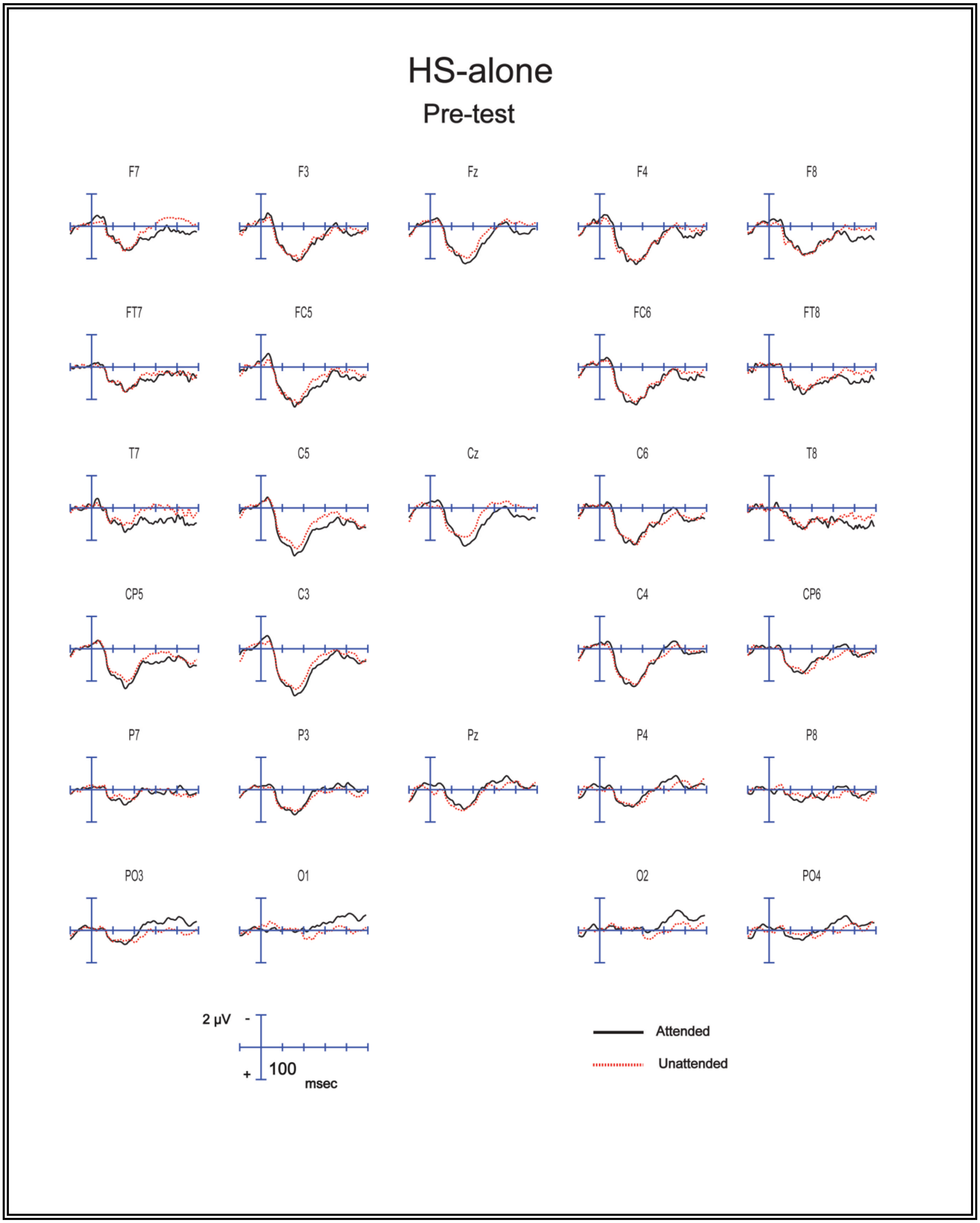


Figure S1b. ERPs from the selective auditory attention paradigm to probes in the attended and unattended stories, for all electrode sites for the ABC group at pre-test.

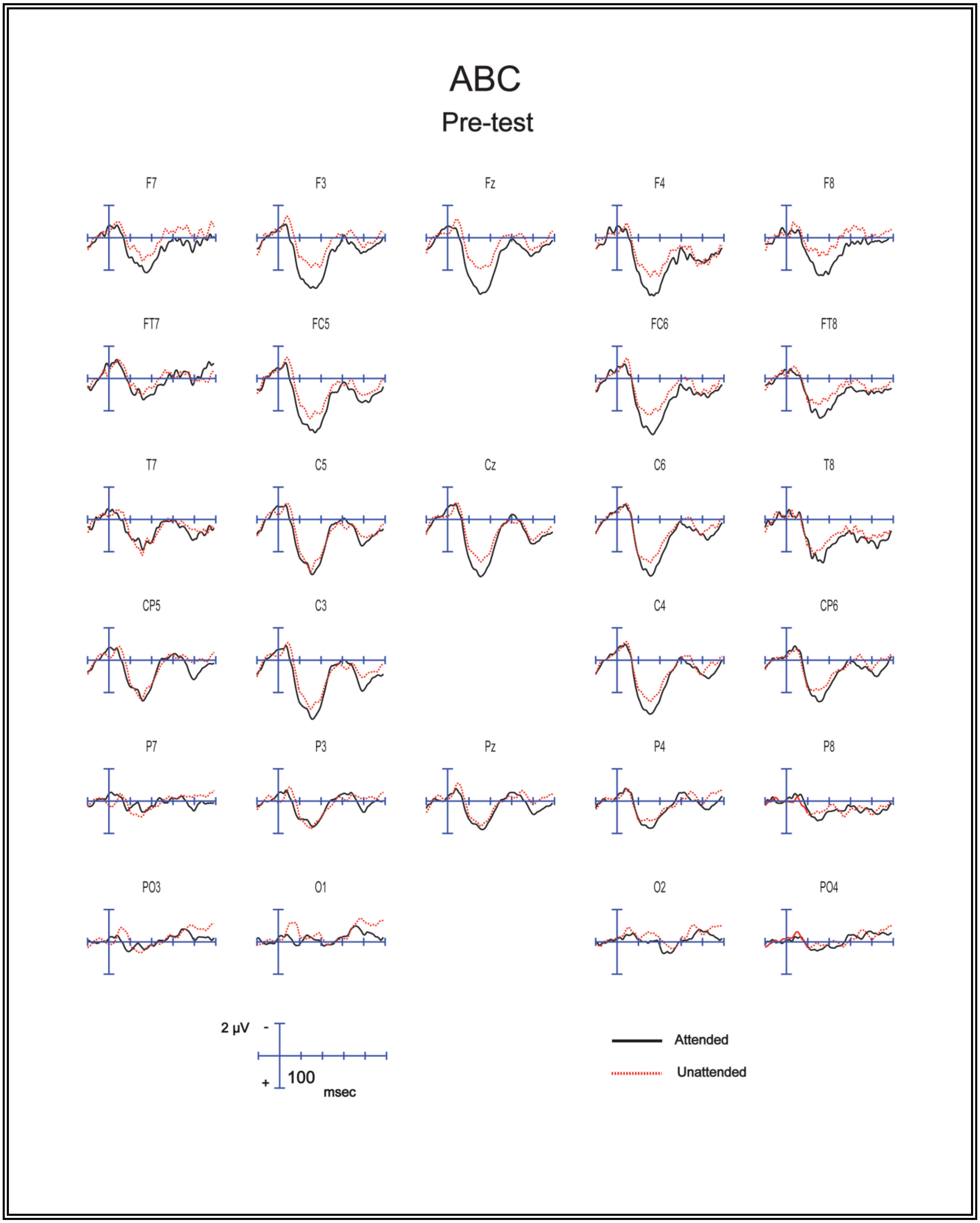


Figure S1c. ERPs from the selective auditory attention paradigm to probes in the attended and unattended stories, for all electrode sites for the PCMC-A group at pre-test.

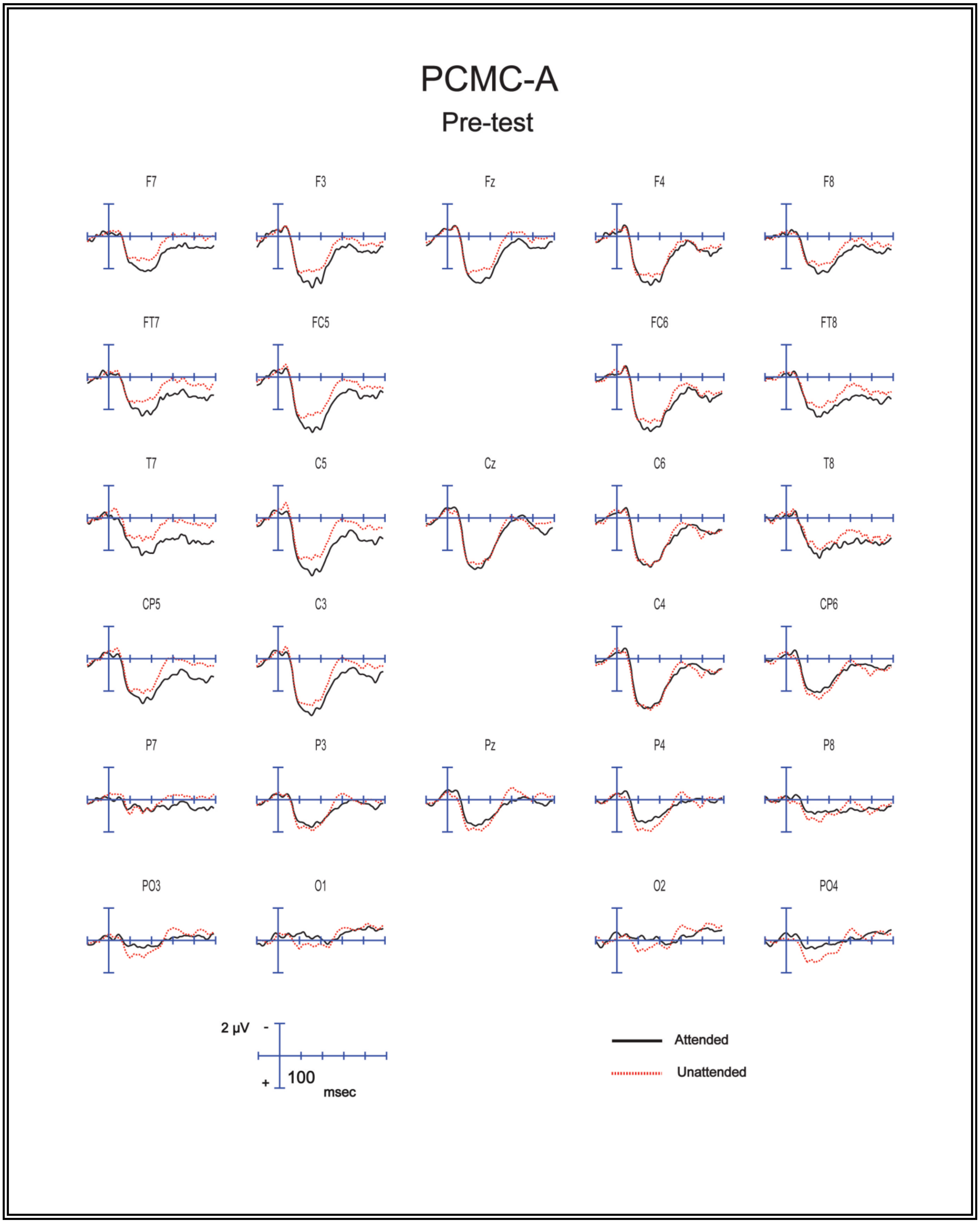


Figure S2a. ERPs from the selective auditory attention paradigm to probes in the attended and unattended stories, for all electrode sites for the HS-alone group at post-test.

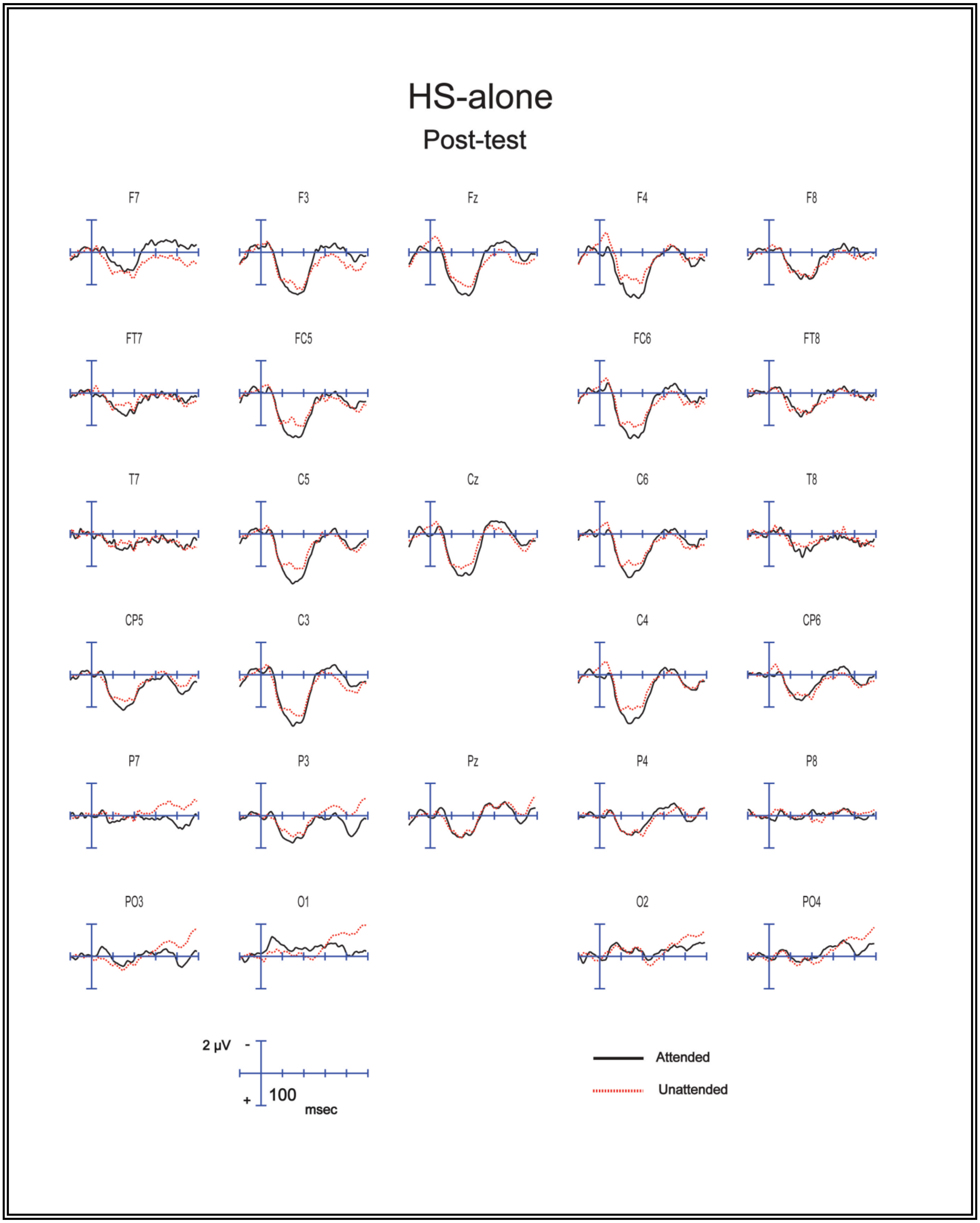


Figure S2b. ERPs from the selective auditory attention paradigm to probes in the attended and unattended stories, for all electrode sites for the ABC group at post-test.

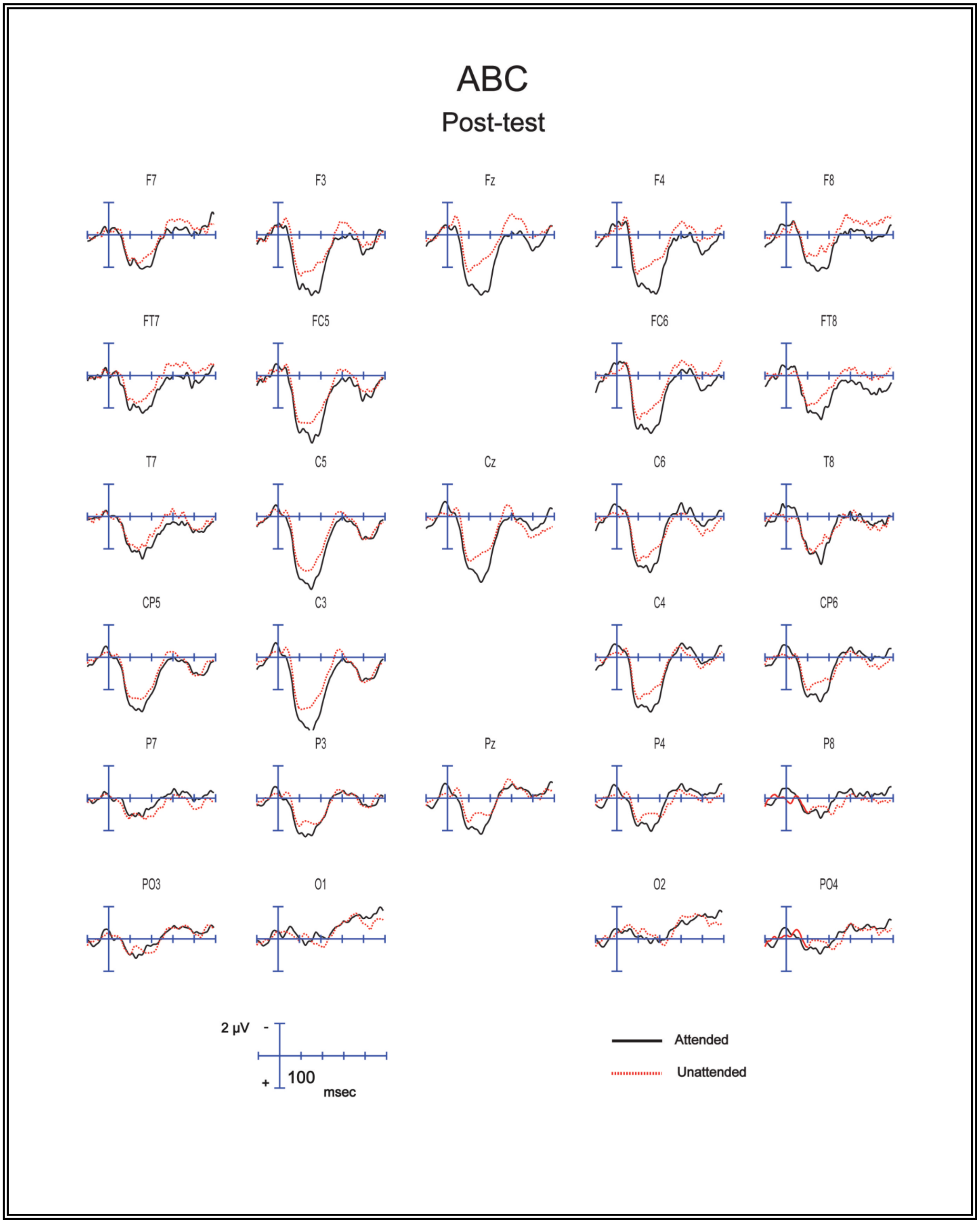


Figure S2c. ERPs from the selective auditory attention paradigm to probes in the attended and unattended stories, for all electrode sites for the PCMC-A group at post-test.

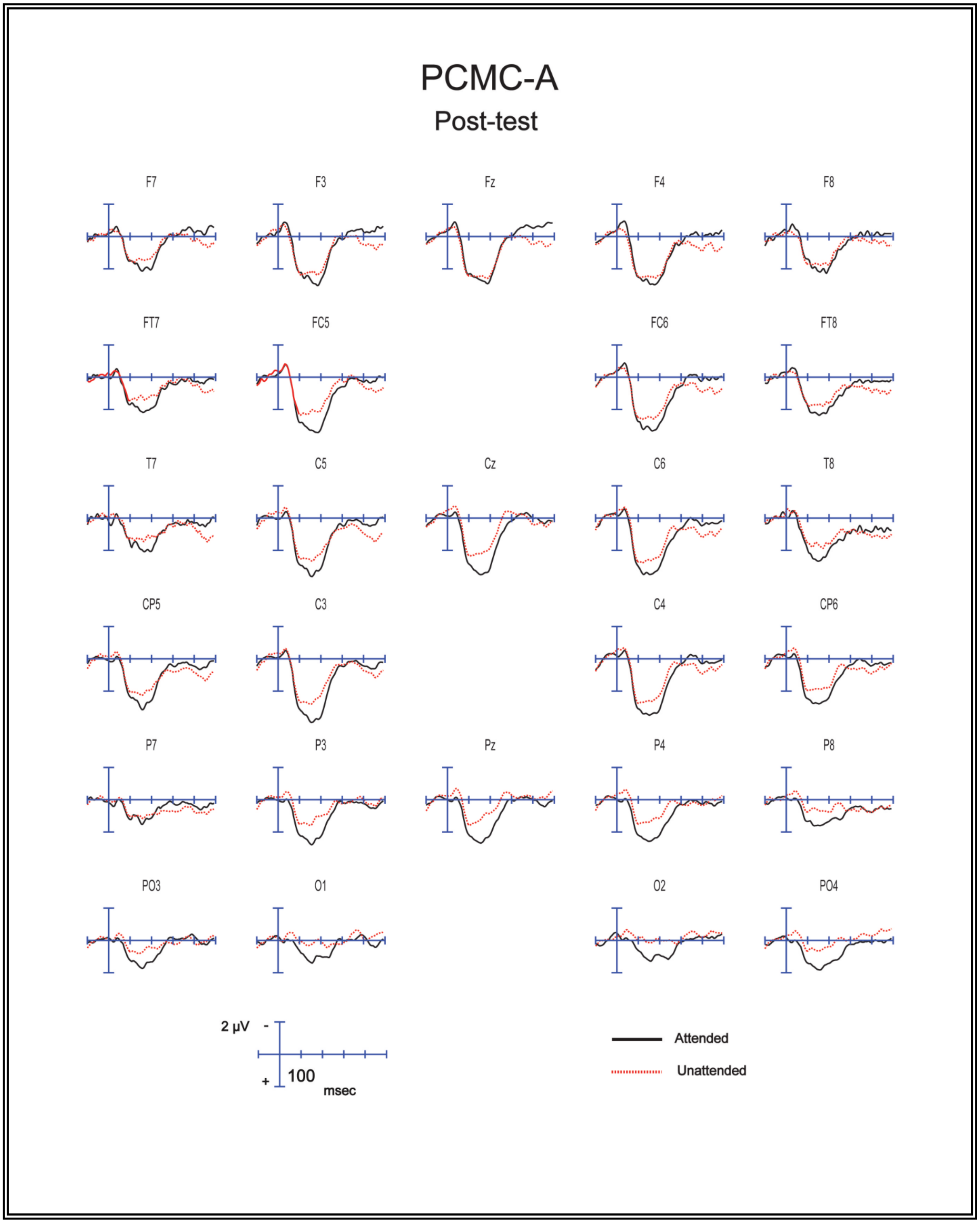


Figure S3a. Difference waves (attend – unattend) from the selective auditory attention paradigm for all electrode sites for the HS-alone group at pre- and post-test.

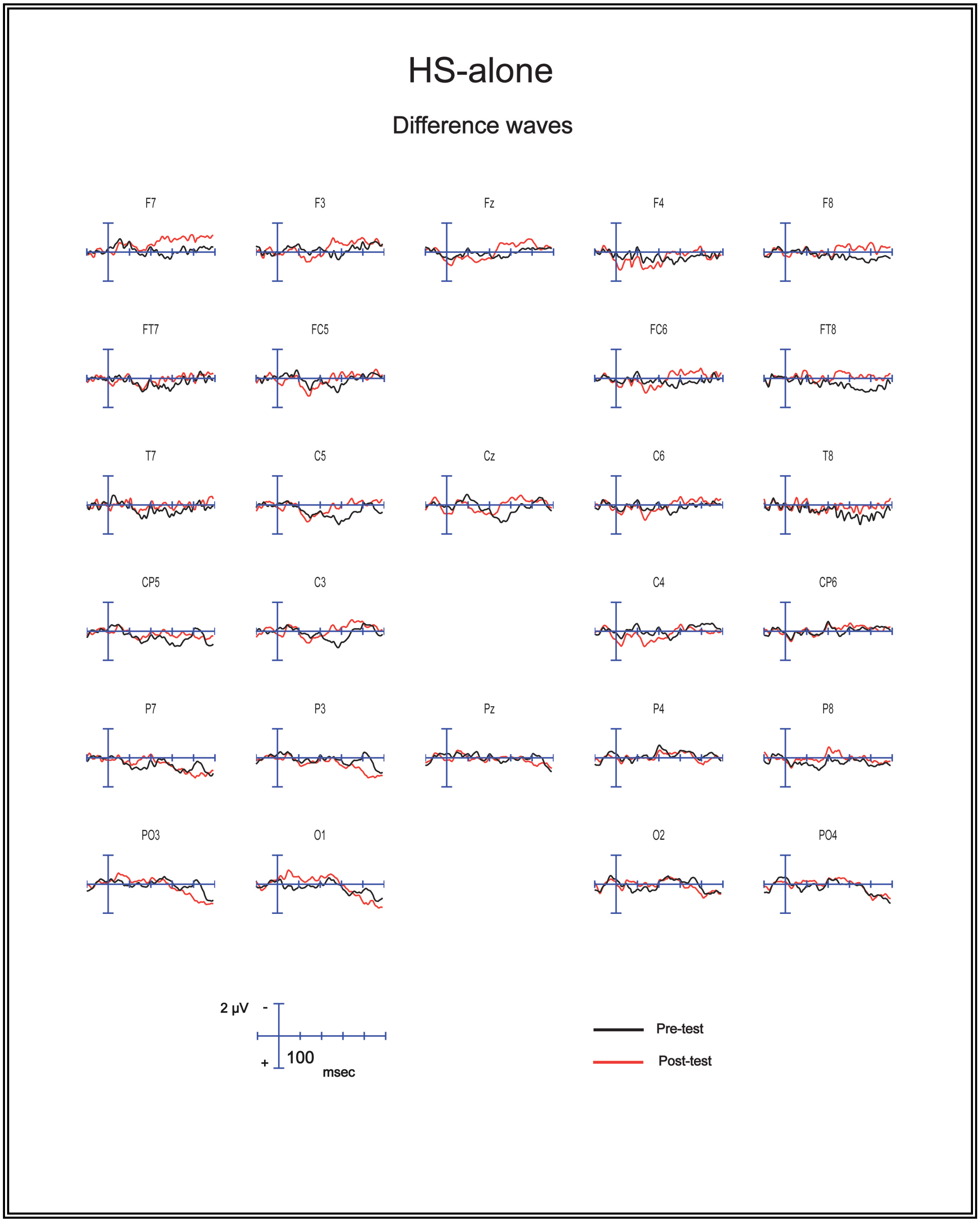


Figure S3b. Difference waves (attend – unattend) from the selective auditory attention paradigm for all electrode sites for the ABC group at pre- and post-test.

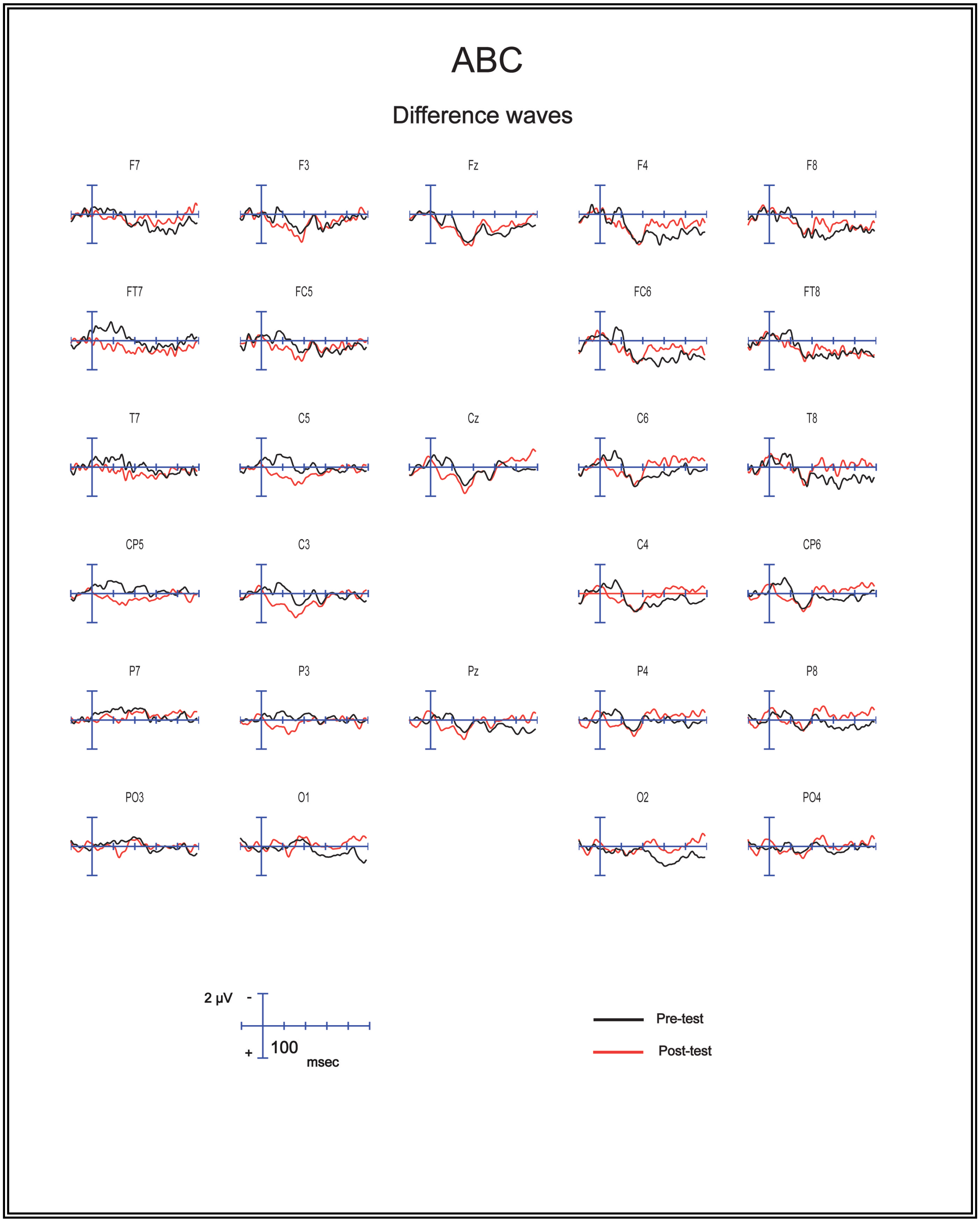


Figure S3c. Difference waves (attend – unattend) from the selective auditory attention paradigm for all electrode sites for the PCMC-A group at pre- and post-test.

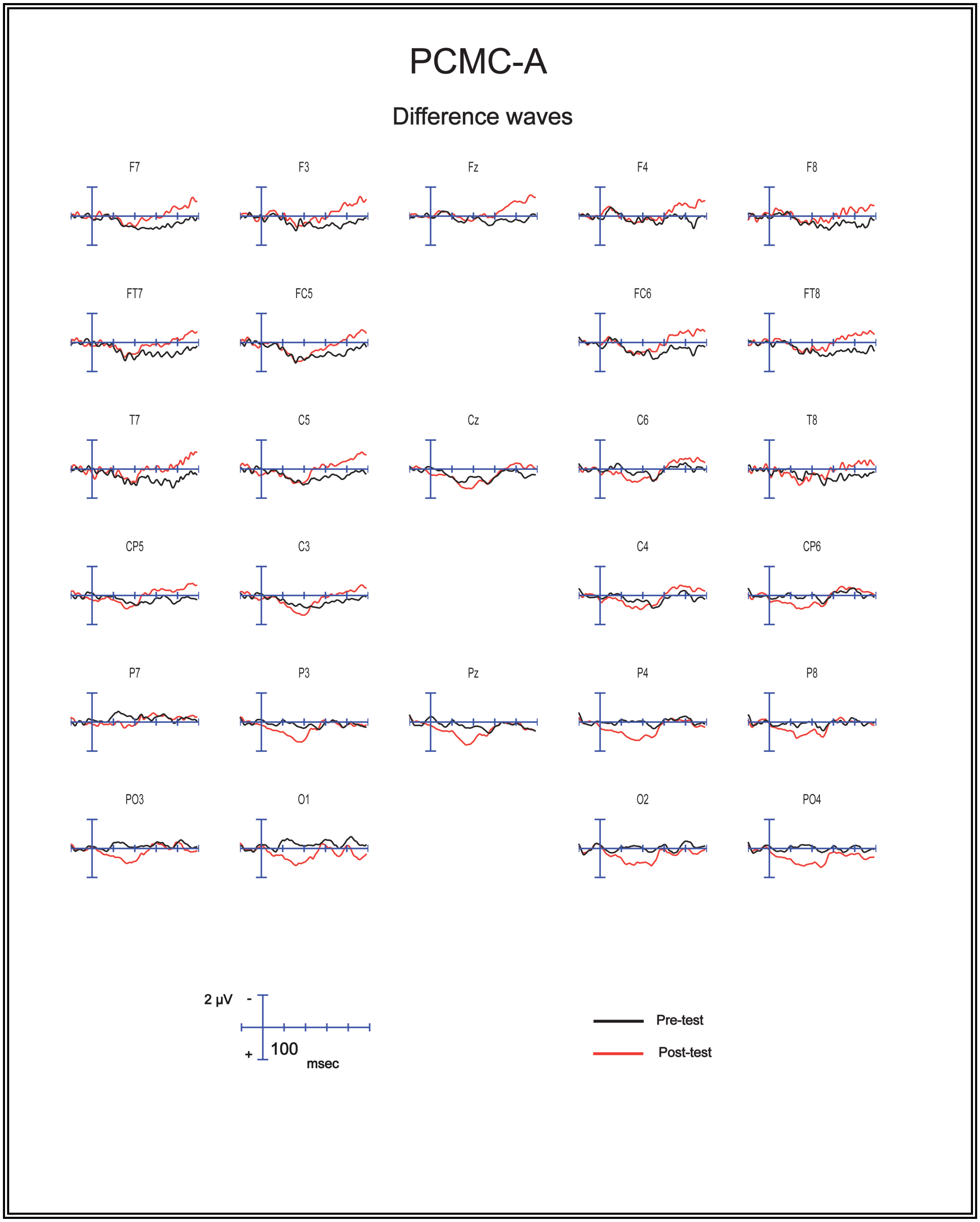
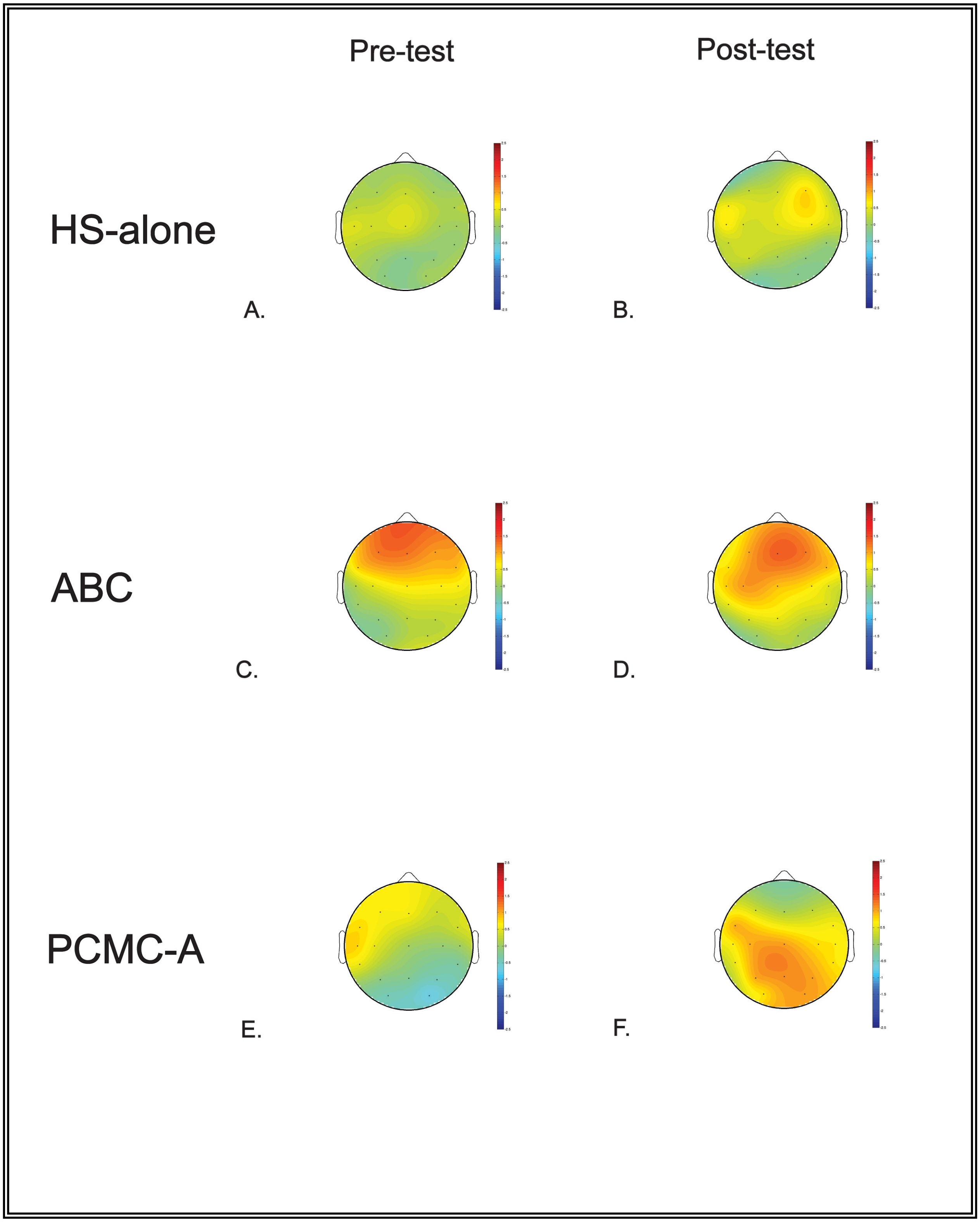


Figure S4. Topographic maps showing the difference in neural response for probes in the attended and unattended channel (attend – unattend; 2.5 μV to -2.5μV). HS-alone: A. pre-test, B. post-test; ABC: C. pre-test, D. post-test; PCMC-A: E. pre-test, F. post-test.



Supplementary Tables

Table S1. Summary of participant background characteristics for the (a) overall analysis and (b) ERP analysis. Maternal education, paternal education, and socioeconomic status coded using the Hollingshead index (57).

(a)

	PCMC-A	HS-alone	ABC
N	66	38	37
#Male	27	18	18
Age in Years (SD)	4.48 (.59)	4.50 (.64)	4.45 (.62)
Maternal Education (SD)	4.41 (1.15)	4.66 (.94)	4.53 (1.07)
Paternal Education (SD)	4.36 (1.00)	4.46 (.81)	4.31 (1.05)
Socioeconomic status (SD)	29.50 (11.10)	29.80 (10.69)	28.03 (8.48)

(b)

	PCMC-A	HS-alone	ABC
N	33	16	16
#Male	15	6	7
Age in Years (SD)	4.65 (.56)	4.68 (.70)	4.53 (.55)
Maternal Education (SD)	4.52 (1.18)	4.71 (.29)	4.47 (1.41)
Paternal Education (SD)	4.43 (1.10)	4.64 (.81)	4.25 (1.29)
Socioeconomic status (SD)	28.47 (11.36)	30.32 (11.32)	31.07 (9.73)

Table S2. Summary of pretest and posttest mean scores and standard deviations (SD) for PCMC-A, ABC, and HS-alone groups on all outcome measures. Where available, both raw and standard scores provided.

(a) Parent self-reports of parenting confidence and ability (based on the format used by 51) and of parenting stress using the Parent Daily Report (50).

	PCMC-A			HS-alone			ABC		
	n	Pre	Post	n	Pre	Post	n	Pre	Post
Confidence & ability									
Confidence	58	3.80	4.16	29	3.83	4.06	26	4.07	4.03
SD		*.66*	*.59*		*.66*	*.82*		*.49*	*.64*
Ability		3.78	4.08		3.72	3.84		4.02	4.07
SD		*.61*	*.62*		*.55*	*.53*		*.55*	*.61*
Parent Daily Report									
Stress	62	4.25	3.07	31	4.87	5.09	27	4.30	4.23
SD		*3.75*	*3.48*		*4.76*	*4.69*		*3.56*	*3.78*

(b) Parent language characteristics and interaction behaviors assessed using a 7-minute video-recorded play dyad session in the laboratory. See main text for description of outcome measures.

	PCMC-A			HS-alone			ABC		
	n	Pre	Post	n	Pre	Post	n	Pre	Post
Language characteristics									
MLU-m	61	5.08	4.80	37	5.05	5.14	29	4.85	4.79
SD		*.88*	*1.14*		*.71*	*.71*		*.72*	*.57*
Type:Token Ratio		.37	.42		.36	.39		.37	.40
SD		*.06*	*.09*		*.06*	*.08*		*.08*	*.09*
Interaction behaviors									
Turn Taking	62	.50	.59	38	.50	.51	30	.53	.52
SD		*.15*	*.15*		*.09*	*.14*		*.15*	*.15*
Modeling		.04	.05		.05	.04		.05	.04
SD		*.05*	*.04*		*.04*	*.04*		*.05*	*.03*

(c) Child behaviors in the home and school environment, assessed by parent and teacher report with the Preschool and Kindergarten Behavior Rating Scale – 2nd edition (47).

	PCMC-A			HS-alone			ABC		
	n	Pre	Post	n	Pre	Post	n	Pre	Post
Parent rating									
Social skills	57	85.91	90.05	35	85.34	86.46	24	89.54	89.33
SD		*8.82*	*8.38*		*11.31*	*10.48*		*8.57*	*9.52*
Problem behaviors		44.56	38.16		45.03	43.86		42.50	44.33
SD		*19.26*	*19.10*		*21.85*	*20.85*		*20.49*	*22.18*
Teacher rating									
Social skills	65	80.34	87.37	37	77.00	81.89	35	82.37	87.09
SD		*15.12*	*11.05*		*18.14*	*14.20*		*9.28*	*8.24*
Problem behaviors		33.83	28.69		37.68	34.89		29.80	27.09
SD		*27.31*	*22.53*		*28.90*	*28.27*		*20.85*	*18.93*

(d) Laboratory measures of child cognition

	PCMC-A			HS-alone			ABC		
	n	Pre	Post	n	Pre	Post	n	Pre	Post
Nonverbal IQ									
Raw Scores	66	11.71	13.45	38	12.10	12.86	36	11.41	12.44
SD		*2.03*	*2.09*		*2.47*	*2.17*		*2.39*	*2.06*
Standard Scores		11.74	12.71		12.07	12.11		11.55	12.01
SD		*1.98*	*1.75*		*1.79*	*1.58*		*1.84*	*1.96*
Language Composite									
Raw Scores	66	13.05	15.67	38	13.70	15.50	36	12.39	14.51
SD		*2.97*	*2.61*		*3.30*	*3.39*		*3.46*	*3.20*
Standard Scores		10.02	11.48		10.45	11.36		9.76	10.63
SD		*2.05*	*1.95*		*1.80*	*2.17*		*2.07*	*2.30*
Preliteracy	66	.37	.52	38	.42	.51	33	.37	.49
SD		*.29*	*.28*		*.28*	*.31*		*.29*	*.28*

Table S3. Regression analysis estimating effects of intervention type on parents' self-reports of parenting confidence and ability (based on the format used by 51) and of parenting stress using the Parent Daily Report (50). Evidence for differential effects of intervention were observed for parent reports of confidence and ability, as well as for the amount of stress per child problem behavior, favoring parents in the PCMC-A intervention.

(a) Parent reports of confidence and ability

	Confidence				Ability			
	B	SE-B	β	P	B	SE-B	β	P
Constant	4.19	.08		<.001	4.10	.06		<.001
Pre-test score	.55	.09	.52	<.001	.59	.08	.58	<.001
PCMC-A vs. HS-alone	-.11	.13	-.07	.421	-.20	.11	-.15	.068
PCMC-A vs. ABC	-.27	.14	-.17	.050	-.15	.12	-.11	.196
Model R^2	.27				.35			
Cohen's D for PCMC-A vs. HS-alone	.12				.34			
Cohen's D for PCMC-A vs. ABC	.50				.25			

(b) Parent reports of parenting stress

	Total Stress			
	B	SE-B	β	P
Constant	3.18	.36		<.001
Pre-test score	.67	.07	.67	<.001
PCMC-A vs. HS-alone	1.61	.63	.18	.012
PCMC-A vs. ABC	1.13	.66	.12	.088
Model R^2	.49			
Cohen's D for PCMC-A vs. HS-alone	-.41			
Cohen's D for PCMC-A vs. ABC	-.29			

Table S4. Regression analysis estimating effects of intervention type on parents' language use and interaction behaviors during a 7-minute recorded play dyad session. Evidence for differential effects of intervention were observed for parents' language use (mean length utterance and type to token ratio) and interaction behaviors (turn-taking), favoring parents in the PCMC-A intervention.

(a) Parents' language use

	MLU-m [a]				Type:Token Ratio (TTR) [b]			
	B	SE-B	β	P	B	SE-B	β	P
Constant	4.77	.11		<.001	.42	.01		<.001
Pre-test score	.42	.10	.36	<.001	.65	.11	.47	<.001
PCMC-A vs. HS-alone	.36	.18	.18	.050	-.03	.02	-.15	.077
PCMC-A vs. ABC	.09	.20	.04	.655	-.02	.02	-.12	.162
Model R^2	.16				.25			
Cohen's D for PCMC-A vs. HS-alone	-.39				.33			
Cohen's D for PCMC-A vs. ABC	-.10				.28			

(b) Parents' interaction behaviors

	Turn Taking				Modeling			
	B	SE-B	β	P	B	SE-B	β	P
Constant	.59	.02		<.001	.05	.01		<.001
Pre-test score	.44	.09	.39	<.001	.26	.08	.29	<.001
PCMC-A vs. HS-alone	-.09	.03	-.26	.003	-.01	.01	-.11	.238
PCMC-A vs. ABC	-.08	.03	-.23	.007	-.01	.01	-.12	.208
Model R^2	.21				.09			
Cohen's D for PCMC-A vs. HS-alone	.58				.25			
Cohen's D for PCMC-A vs. ABC	.56				.28			

[a] Mean length utterance in morphemes. Lower scores indicate closer approximation to child speech.
[b] Type to token ratio, an estimate of lexical diversity. Higher numbers indicate greater lexical diversity.

Table S5. Regression analysis estimating effects of intervention type on PKBS-2 raw score ratings of children's behavior (social skills and problem behavior composites). Evidence for differential effects of intervention were observed for parent reports of child problem behaviors and positive social skills, favoring children in the PCMC-A intervention.

(a) Parent ratings of behavior

	Social Skills[a]				Problem Behaviors[b]			
	B	SE-B	β	P	B	SE-B	β	P
Constant	90.45	.86		<.001	37.93	1.61		<.001
Pre-test score	.69	.06	.72	<.001	.80	.06	.80	<.001
PCMC-A vs. HS-alone	-3.20	1.40	-.16	.024	5.32	2.61	.12	.044
PCMC-A vs. ABC	-3.24	1.60	-.14	.046	7.83	2.96	.16	.009
Model R^2	.53				.65			
Cohen's D for PCMC-A vs. HS-alone	.34				-.26			
Cohen's D for PCMC-A vs. ABC	.35				-.39			

[a] Higher scores indicate a greater number of positive social skill behaviors.
[b] Higher scores indicate a greater number of problem behaviors.

(b) Teacher ratings of behavior

	Social Skills[a]				Problem Behaviors[b]			
	B	SE-B	β	P	B	SE-B	β	P
Constant	87.15	.91		<.001	28.70	1.53		<.001
Pre-test score	.59	.04	.76	<.001	.76	.04	.85	<.001
PCMC-A vs. HS-alone	-3.51	1.52	-.14	.022	3.29	2.55	.06	.200
PCMC-A vs. ABC	-1.48	1.54	-.06	.338	1.45	2.60	.03	.579
Model R^2	.61				.73			
Cohen's D for PCMC-A vs. HS-alone	.31				-.14			
Cohen's D for PCMC-A vs. ABC	.13				-.06			

[a] Higher scores indicate a greater number of positive social skill behaviors.
[b] Higher scores indicate a greater number of problem behaviors.

Table S6. Regression analysis estimating effects of intervention on laboratory assessments of child cognition, including (a) standardized assessments (nonverbal IQ and receptive language) and (b) preliteracy task.

a) Child standardized assessments – Raw Scores

	Nonverbal IQ				Language Composite			
	B	SE-B	β	P	B	SE-B	β	P
Constant	13.46	.17		<.001	15.67	.19		<.001
Pre-test score	.59	.06	.62	<.001	.72	.05	.77	<.001
Age	.73	.23	.21	.002	.64	.27	.13	.022
PCMC-A vs. HS-alone	-.83	.28	-.17	.003	-.65	.32	-.10	.045
PCMC-A vs. ABC	-.80	.28	-.17	.005	-.65	.33	-.10	.049
Model R^2	.61				.73			
Cohen's D for PCMC-A vs. HS-alone	.40				.22			
Cohen's D for PCMC-A vs. ABC	.38				.22			

b) Preliteracy task

	B	SE-B	β	P
Constant	.53	.02		<.001
Pre-test score	.76	.06	.77	<.001
Age	.03	.03	.06	.350
PCMC-A vs. HS-alone	-.05	.04	-.08	.151
PCMC-A vs. ABC	-.03	.04	-.05	.372
Model R^2	.64			
Cohen's D for PCMC-A vs. HS-alone	.18			
Cohen's D for PCMC-A vs. ABC	.12			

Table S7. ERP attrition by group.

	HS-alone	ABC	PCMC-A
Initial N:	38	37	66
Successfully scheduled and capped at pre-test:	31	27	55
N after artifact rejection at pre-test:	24	20	47
Answered 50% of story questions at pre-test:	21	20	44
Successfully scheduled and capped at post-test:	19	17	40
N after artifact rejection at post-test:	17	17	35
Answered 50% of story questions at post-test:	16	16	33

Note: ERP assessment of young children can be challenging, as it requires that children sit relatively still for an extended period of time without excessive moving or blinking. These attrition rates are comparable to other child ERP studies in the literature, especially given that, in order to be retained, a child has to provide ERP data with a sufficient signal/noise ratio at both pre- and post-testing

Table S8. Summary of significant interactions and step-down analyses of the neural response to attended stimuli for the comparison of PCMC-A and ABC

Source	*df*	*F*	*p*
Omnibus			
G x T x A/P	2, 94	4.54	.024
Within ABC			
T	1, 32	1.77	.204
T x A/P	2, 64	0.28	.691
Within PCMC-A			
T	1, 32	5.41	.027
T x A/P	2, 64	9.67	.000
PCMC-A gains by row	*df*	*T*	*p*
Anterior row	32	-0.27	.791
Central row	32	1.34	.190
Posterior row	32	4.70	.000

Note: T = Time; A/P = Anterior/posterior; G = Group

Table S9. Summary of significant interactions and step-down analyses of the neural response to attended stimuli for the comparison of PCMC-A and HS-alone

Source	*df*	*F*	*p*
Omnibus			
G x T x A/P	2, 94	7.83	.003
Within HS-only			
T	1, 15	0.002	.966
T x A/P	2, 30	1.80	.198
Within PCMC-A			
T	1, 32	5.41	.027
T x A/P	2, 64	9.67	.000
PCMC-A gains by row	*df*	*T*	*p*
Anterior row	32	-0.27	.791
Central row	32	1.34	.190
Posterior row	32	4.70	.000

Note: T = Time; A/P = Anterior/posterior; G = Group

Supplementary References

1. Diamond A (2006) The early development of executive functions. *Lifespan Cognition: Mechanisms of Change*, eds Bialystok E & Craik F (Oxford University Press), pp 70-95.
2. Fan J, McCandliss BD, Sommer T, Raz A, & Posner MI (2002) Testing the efficiency and independence of attentional networks. *J Cogn Neurosci* 14(3):340-347.
3. Ridderinkhof KR & van der Stelt O (2000) Attention and selection in the growing child: Views derived from developmental psychophysiology. *Biological Psychology* 54:55-106.
4. Bredekamp S & Rosengrant T (1992) *Reaching potentials: Appropriate curriculum and assessment for young children* (NAEYC, Washington DC).
5. Wood FB, Bruner J, & Ross G (1976) The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry* 17:89-100.
6. Vygotsky L (1978) *Mind and society: The development of higher mental processes* (Harbard University Press, Cambridge).
7. Reid JB, Eddy JM, Fetrow RA, & Stoolmiller M (1999) Description and immediate impacts of a preventive intervention for conduct problems. *American Journal of Community Psychology* 27(4):483-517.
8. Brookfield S (1991) The development of critical reflection in adulthood. *New Education* 13:39-48.
9. Birkey R & Rodman J (1995) Adult learning styles and preferences for technology programs. *Lifelong Learning: Innovations in Higher Education, Technology, and Workplace Literacy Conference*.
10. Tuijnman A & Van Der Kamp M eds (1992) *Learning across the Lifespan: Theories, Research, Policies* (Pergamon Press, Tarrytown, NY).
11. Patterson G & Forgatch M (1985) Therapist behavior as a determinant for client noncompliance: A paradox for the behavior modifier. *Journal of Consulting and Clinical Psychology* 53:846-851.
12. Patterson G (2005) The next generation of PMTO models. *The Behavior Therapist* 28:25-32.
13. Bandura A (1997) *Self-efficacy: The exercise of control* (Freeman, New York).
14. Hart S, Petrill S, Deater-Deckard K, & Thompson L (2007) SES and CHAOS as environmental mediators of cognitive ability: A longitudinal genetic analysis. *Intelligence* 35:233-242.
15. Gresham F, MacMillan D, Beebe-Frankenberger M, & Bocian K (2000) Greatment integrity in learning disabilities intervention research: Do we really know how treatments are implemented? *Learning Disabilities Research & Practice* 15(4):198-205.
16. Coch D, Sanders LD, & Neville HJ (2005) An event-related potential study of selective auditory attention in children and adults. *Journal of Cognitive Neuroscience* 17(4):605-622.
17. Sanders L, Stevens C, Coch D, & Neville HJ (2006) Selective auditory attention in 3- to 5-year-old children: An event-related potential study. *Neuropsychologia* 44:2126-2138.
18. Stevens C, Lauinger B, & Neville H (2009) Differences in the neural mechanisms of selective attention in children from different socioeconomic backgrounds: An event-related brain potential study. *Developmental Science* 12(4):634-646.
19. Clark E (1998) *I love you, Blue Kangaroo* (Bantom Doubleday Dell Publishing Group, Inc, Italy).
20. Clark E (2000) *Where are you, Blue Kangaroo?* (Random House Children's Books, Italy).
21. Clark E (2002) *It was you, Blue Kangaroo* (Random House Children's Books, Italy).
22. Clark E (2003) *What shall we do, Blue Kangaroo?* (Random House Children's Books, Italy).
23. Zion E & Graham M (1956) *Harry the dirty dog* (HarperCollins Children's Books, United

States).
24. Zion E & Graham M (1960) *Harry and the lady next door* (HarperCollins Children's Books, United States).
25. Zion E & Graham M (1965) *Harry by the sea* (HarperCollins Children's Books, United States).
26. Zion E & Graham M (1976) *No roses for Harry!* (HarperCollins Children's Books, United States).
27. Johnson DB (2000) *Henry hikes to Fitchburg* (Houghton Mifflin Co, New York).
28. Johnson DB (2002) *Henry builds a cabin* (Houghton Mifflin Co, New York).
29. Johnson DB (2003) *Henry climbs a mountain* (Houghton Mifflin Co, New York).
30. Johnson DB (2004) *Henry works* (Houghton Mifflin Co, New York).
31. Wells R (1991) *Max's dragon shirt* (Penguin Group, New York).
32. Wells R (1997) *Bunny money* (Penguin Group, New York).
33. Wells R (2000) *Max cleans up* (Puffin Books, New York).
34. Wells R (2002) *Ruby's beauty shop* (Penguin Group, New York).
35. Munsch R & Martchenko M (1988) *Angela's airplane* (Turtleback, Eastsound, WA).
36. Munsch R & Martchenko M (1992) *50 below zero* (Turtleback, Eastsound, WA).
37. Munsch R & Martchenko M (2007) *Thomas' snowsuit* (Annick Press, Toronto, ON).
38. Munsch R & Suomalainen S (1996) *Mud puddle* (Perfection Learning, Logan, IA).
39. Sanders L, Stevens C, Coch D, & Neville H (2006) Selective auditory attention in 3- to 5-year-old children: An event-related potential study. *Neuropsychologia* 44:2126-2138.
40. Stevens C*, et al.* (2013) Examining the role of attention and instruction in at-risk kindergarteners: Electrophysiological measures of selective auditory attention before and after an early literacy intervention. *Journal of Learning Disabilities* 46:73-86.
41. Stevens C, Lauinger B, & Neville H (2009) Differences in the neural mechanisms of selective attention in children from different socioeconomic backgrounds: An event-related brain potential study. *Developmental Science* 12:634-646.
42. Roid GH (2003) *Stanford-Binet Intelligence Scales: Fifth Edition* (Riverside Publishing, Itasca, IL).
43. Wiig EH, Secord WA, & Semel E (2004) *Clinical evaluation of language fundamentals - Preschool (CELF-P:2)* (The Psychological Corporation: Harcourt Assessment, Inc., San Antonio, TX) Preschool 2nd edition Ed.
44. Early Childhood Research Institute on Measuring Growth and Development (1998) Research and development of individual growth and development indicators for children between birth and age eight (Technical Report No. 4). (Center for Early Education and Development, University of Minnesota, Minneapolis, MN).
45. Clay M (2002) An observation survey of early literacy achievement. (Heinemann, Portsmouth, NH).
46. Kochanska G, Murray KT, Jacques TY, Koenig AL, & Vandegeest KA (1996) Inhibitory control in young children and its role in emerging internalization. *Child Development* 67(2):490-507.
47. Merrell K (2002) Preschool and Kindergarten Behavior Scales, Second Edition. (PRO-ED, Austin).
48. Domitrovich C, Cortes R, & Greenberg M (2007) Improving young children's social and emotional competence: A randomized trial of the preschool PATHS curriculum. *Journal of Primary Prevention* 28:67-91.
49. Edwards M, Whiteside-Mansell L, Connors N, & Deere D (2003) The unidimensionality and reliability of the preschool and kindergarten behavior scales. *Journal of Psychoeducational Assessment* 21:16-31.
50. Chamberlain P & Reid J (1987) Parent observation and report of child symptoms. *Behavioral Assessment* 9:97-109.

51. Webster-Stratton C & Lindsay D (1999) Social competence and conduct problems in young children: Issues in assessment. *Journal of Clinical Child Psychology* 28:25-43.
52. Delaney EM & Kaiser AP (2001) The Effects of Teaching Parents Blended Communication and Behavior Support Strategies. *Behavioral Disorders* 26(2):93-116.
53. Mahoney G (1988) Enhancing the developmental competence of handicapped infants. *Parent-child interaction and developmental disabilities*, ed Marfo K (Praeger, New York).
54. Weizman Z & Snow C (2001) Lexical input as related to children's vocabulary acquisition: Effects of sophisticated exposure and support for meaning. *Developmental Psychology* 37:265-267.
55. MacDonald J (1989) *Becoming partners with children: From play to conversation* (Symbolix, Chicago).
56. Girolametto L, Weitzman E, Wiigs M, & Pearce P (1999) The relationship between maternal language measures and language development in toddlers with expressive vocabulary delays. *American Journal of Speech-Language Pathology* 8:364-374.
57. Hollingshead AB (1975) Four factor index of social status. in *Unpublished working paper* (Department of Sociology, Yale University, New Haven, CT).