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ORIGINAL PAPER

Online ACT Matrix Parent Training for Japanese-Speaking Mothers with Distress in the United States

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Abstract

Cultural stigma, shame, self-concealment, and language and socio-economic barriers often keep Asian immigrant parents and children away from mental and behavioral services in the United States. Research shows that increased levels of parent distress suggest a negative impact on parenting practices and correlate child-maltreatment. Therefore, this study aimed to test one functionally contextual strategy to address such issues. The current study evaluated the effects of an online Acceptance and Commitment Training (ACT) Matrix for Japanese-speaking mothers living the United States. A nonconcurrent multiple baseline single-subject design across four mothers was used to assess the effect of ACT Matrix on value-driven behaviors, parental engagement (session attendance and daily assignment completion), parental distress, and psychological flexibility. The study consisted of a baseline, treatment (three ACT Matrix treatment sessions adapted from the six-step protocol), maintenance, and follow-up phases. A visual analysis reporting level, trend, variability, immediacy of change and overlap was used to identify a functional relation between the treatment and observable overt behaviors of value-driven behaviors and daily assignment completion. In addition, a non-overlap of all pairs was used to measure effect sizes for these behaviors. For psychological flexibility and parental distress, we used the reliable change index to assess whether clinically significant improvement occurred or not. The results revealed that the online ACT Matrix parent training program was effective in improving all four dependent variables. Mothers reported that the training was culturally sensitive, effective, and acceptable. The details of findings and the implications for future research as preventive science are discussed.

Keywords Online ACT Matrix · Cultural sensitivity · Japanese-speaking parents · Parental distress · Psychological flexibility

Highlights

- This is the first single-subject-design research that evaluated an adapted online ACT Matrix six-step protocol via telehealth.
- This study aimed to explore a contextually functional treatment for distressed Japanese-speaking parents in the U.S.
- Treatment improved distress, psychological flexibility, value-driven behavior, and participation of distressed Japanese-speaking parents.
- Japanese immigrant mothers reported that the treatment was culturally sensitive, effective, and acceptable.
- This study contributes to prevention science by highlighting health disparities and needs for culturally sensitive approach.

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At almost 6% of the population, Asian Americans make up the fastest growing racial group in the United States (United States Census Bureau, 2021) and are projected to become the largest racial group of American immigrants by 2060 (Budiman & Ruiz, 2021). Although acculturation levels, socioeconomic status, and cultural and linguistic backgrounds of this population are diverse (Choi & Park, 2022), Asian Americans have been stereotyped as the model minority: a problem-free, high-achieving, successful minority group (Wu, 2013). This myth masks challenges and

needs that Asian Americans hold and compels them to keep their hardships to themselves. To make things worse, the COVID-19 pandemic escalated anti-Asian discrimination leading to increased levels of mental health problems and psychological distress among Asian American families (Choi & Park, 2022; Zhou et al., 2021).

First-generation Asian immigrant parents, specifically, often experience high levels of psychological stress as they attempt to acculturate to a new culture where a different language and cultural practices are the norms (Kayama & Yamanaka, 2020; Liu et al., 2020). In addition, they may experience social isolation as they are living in a new country with limited access to culturally and linguistically responsive social support. This, along with the acculturation gap between parents and children living within a bicultural family unit, can create parent-child conflict that also contributes to increased parental distress, anxiety, and depression among other mental health issues (Choi & Park, 2022; Liu et al., 2020; Ueda et al., 2020). These factors can have a negative impact on parenting practices and can increase the risk for child-maltreatment such as mental abuse, neglect, and physical violence (Liu et al., 2020; Thor et al., 2022). Specifically, research has revealed that parental stress strongly correlates to child neglect as a form of parental burnout (Griffith, 2020) among Asian immigrant families (Thor et al., 2022).

Although Asian Americans experience mental distress at equal or higher level than non-Hispanic Whites (Yasui et al., 2021), they are less likely to seek mental health services compared to non-Hispanic Whites and tend to wait until their conditions deteriorate to severe levels (Abe-Kim et al., 2007; Lee et al., 2021; Yasui et al., 2021). Moreover, first- and second-generation Asian-Americans use fewer services for mental health issues compared to third-generation individuals (Abe-Kim et al., 2007; Ihara et al., 2014; Shahid et al., 2021). There are a variety of factors contributing to such mental health disparities, including cultural stigma, shame, self-concealment within their own collective cultures, a lack of linguistically and culturally sensitive services, a lack of awareness of resources for behavioral and mental health (e.g., travel means, cost, and time), and/or a lack of self-awareness and sensitivity to mental health needs they experience (Hayes et al., 2011; Ihara et al., 2014; Lee et al., 2021; Thor et al., 2022; Masuda & Boone, 2011; Ueda et al., 2020). Although parents might initiate and seek help, the above-mentioned contextual and psychological barriers discourage them from continued engagement in a treatment program (Yasui et al., 2021). As a result, among first-generation Asian immigrant families, there is an alarming situation where parental distress, coercive parent-child interactions, child neglect, and parent withdrawal may be overlooked or inadequately addressed (Abe-Kim et al. 2007; Thor et al., 2022). This current state of high distress level among Asian American immigrant parents calls for a preventive treatment program that delivers culturally, linguistically, and contextually sensitive services and treatment to ameliorate such challenging overt and covert behaviors (Biglan et al., 2008; Biglan & Hays, 1996; Hamari et al., 2021; Thor et al., 2022; Williams, 2021, Yasui et al., 2021).

Acceptance and Commitment Therapy (ACT) is an emerging yet effective evidence-based strategy for working with parents with distress (Hayes et al., 2012; Byrne et al., 2021; Garcia et al., 2021). ACT is a process-based intervention rooted in behavior-analytic principles, functional contextualism, relational frame theory, and evolutionary principles (Dixon et al., 2020; Hayes et al., 2012; Tarbox et al., 2022). The main goal of ACT is to foster psychological flexibility, which is the capacity to contact and hold unpleasant internal experiences (i.e., private events: thoughts, feelings, emotions, memories, and bodily sensations) in the moment and choose to engage in an action that aligns with one's deepest desire and yearning. Psychological flexibility is cultivated through six core processes: acceptance, defusion, present moment awareness, self-as-context, values, and committed action (Hayes et al., 2012; Tarbox et al., 2022; see Table 1 for brief description).

Increased psychological flexibility through ACT interventions have correlated with lower levels of parental stress,

Table 1 Brief description of ACT six processes

Process	Brief description
Acceptance	Embracing uncomfortable private events without avoiding or resisting them
Defusion	Changing one's way to respond to difficult private events by understanding one's thoughts are just thoughts that do not have to control one's actions
Present moment awareness	Contacting experiences within one's self and in the environment at the present moment
Self-as-context	Shifting among various perspectives within self and others across time and space
Values	Identifying what is meaningful and important to oneself that guides one's behaviors which would result in most socially significant positive consequences even if they may not be immediately available
Committed action	Engaging in actions consistent with one's values

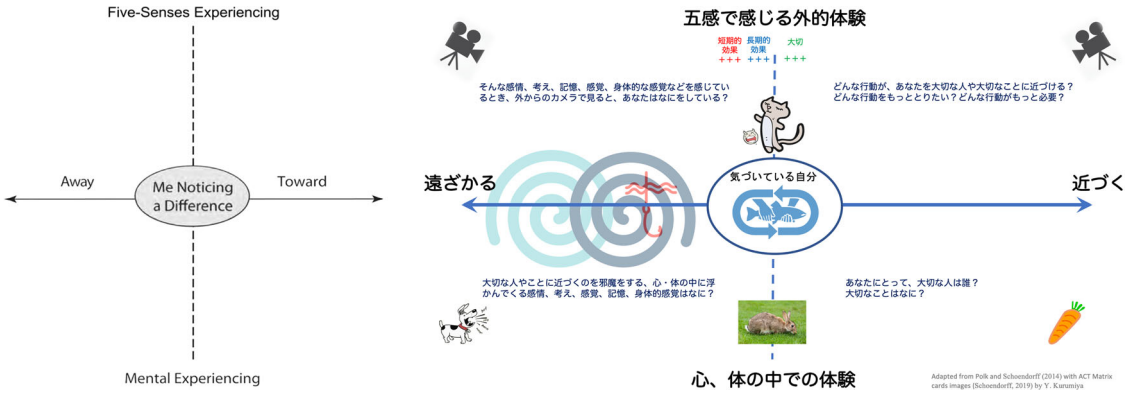

Fig. 1 The ACT Matrix and the adapted ACT Matrix in Japanese used in training sessions. The left panel displays the basic ACT Matrix in English (Polk & Schoendorff, 2014).The right panel displays the Japanese ACT Matrix adapted by the first author with ACT Matrix card images (Schoendorff, 2019). Visuals were varied and gradually added as training sessions proceeded.

anxiety, and depression; higher levels of adaptive parenting and quality of life; and more frequent observations of value-driven behaviors (Byrne et al., 2021; Fonseca et al., 2020; Garcia et al., 2021; Gould et al., 2018; Han et al., 2021; Moyer & Sandoz, 2015). In addition, ACT has been effectively adapted to train parents in multiple global settings and diverse languages and populations. For example, in Hong Kong, ACT parent training plus asthma education improved parents' psychological flexibility, stress, anxiety, and quality of life, and parental management of their child's asthma (Chong et al., 2019). In Iran, ACT parental interventions promoted psychological flexibility and improved anxiety-related intolerance of uncertainty in parents of children with hearing impairment (Gharashi et al., 2019). Another ACT study in Iran by Salimi et al. (2019) demonstrated the effectiveness on emotional cognitive regulations (e.g., positive focuses, positive reevaluation, self-blame and blaming of others) of parents with children with autism. In India, ACT parental training improved psychological flexibility, anxiety, depression, and quality of life of parents with children with neurodevelopmental disorders (Poddar et al., 2015).

Despite this mounting evidence, additional research is needed to explore the effectiveness of ACT studies with parents across multiple languages and populations such as Japanese immigrant parents and other Asian immigrant parents in the U.S. In addition, to our knowledge, studies on the effectiveness of ACT parent training for distressed parents with children without any known diagnoses, health conditions, or at risk do not exist. Thus, such studies are needed as prevention science research (Biglan et al., 2008; Biglan & Hayes, 1996) on parental distress, parental burnout, and child-maltreatment (Griffith, 2020).

Considerations in ACT parent training include dosage levels and variations that account for parents' busy schedules, limited resources, and cultural backgrounds. The ACT Matrix (Polk & Schoendorff, 2014; Polk et al., 2016) is a simple interactive tool that can help individuals notice and sort their five-senses experiences, inner-mental experiences, and actions into a four-quadrant grid. It also allows individuals to notice functionality and workability of their actions and to choose to engage in behavior that is consistent with their values (what and who is important to them) with psychological flexibility (Polk & Schoendorff, 2014; Polk et al., 2016). The ACT Matrix's (see Fig. 1) four quadrants are intersected by a horizontal line and a vertical line, with one circle placed in the intersection marked as "Me Noticing a Difference." The horizontal line discriminates between negatively reinforced behavior and positively reinforced behavior. Thus, it is labeled "away" (on the left) and "toward" (on the right), referring to away from inner aversive experiences (experiential avoidance) and toward what is important to them (valued action). The vertical line is labeled "five-senses experiencing" (on the top), referring to overt behaviors that are observable by others, and "mental experiencing" (on the bottom), referring to private events such as thoughts, feelings, emotions, memories, and bodily sensations.

Through the process of noticing, discriminating, and sorting overt and covert behaviors in response to the visual cues, the ACT Matrix allows individuals to naturally and flexibly distance themselves from verbal content or "stories" in their mind (e.g., thoughts, memories). Thus, it offers an opportunity to consider the purpose of one's actions (both short-term and long-term outcomes) in relation to one's values and goals. Teaching parents to use these discrimination skills may help them reduce unhelpful, negatively reinforced "away" moves linked to ineffective behavioral patterns (e.g., yelling at their children), while increasing effective, sustainable behaviors in the service of their values.

Although empirical studies using the ACT Matrix are limited, it has been successfully used to improve diet, exercise behaviors, valued action, and psychological flexibility in adults (Levin et al., 2017, 2022), to alleviate complex chronic pain and problematic opioid dependence

after surgery (Weinrb et al., 2017), to improve health-related behavior and physical self-care (Barreto et al., 2019), and as an intervention component for increasing value-based behaviors in parents with children with autism (Gould et al., 2018). Taken together, it is a promising and efficient behavior change intervention tool. Nevertheless, there is a dearth of research using this intervention tool with parents from culturally and linguistically diverse populations, and in particular, racial minorities such as Japanese immigrant parents living outside of their home country.

Cultural sensitivity to pragmatic and contextual variables within Asians and Asian Americans and to each unique individual within these minority groups is imperative to culturally competent practices (see Hayes, 2015; Masuda, 2014). This requires a dynamic, microadjustment process, linking cultural knowledge to behavior analytics, functional contextual processes, and procedures (Biglan & Hayes, 1996; Yasui et al., 2021) between a clinician and a client in the moment (Hayes et al., 2011; Masuda, 2014). Considering the contextual and psychological barriers (e.g., cultural stigma, shame, self-concealment, a lack of self-awareness, and sensitivity to mental health needs) to help-seeking from professionals and treatment adherence, an ACT Matrix parent training program delivered in a culturally sensitive manner and provided privately via telehealth could be promising for Japanese-speaking immigrant parents.

To date, to the best of our current knowledge, there is no empirical research examining the effects of the ACT Matrix six-step protocol in person or via telehealth. As such, the purpose of the current study was to evaluate the effects of an online ACT Matrix parent training program adapted from the six-step protocol into the format of 1:1 private training delivered via videoconferencing on overt value-driven behaviors and parental engagement in treatment, parental distress, and psychological flexibility. In addition, we aimed to examine the treatment's social validity with Japanese-speaking parents with children without known diagnoses in the U.S. We hypothesized that, compared to baseline levels, data would demonstrate increases in observable parent value-driven behaviors, parental engagement, and psychological flexibility and decreases in parental distress and psychological inflexibility reported by parents. Additionally, we hypothesized that participants would consider this treatment model culturally sensitive, effective, and acceptable at a high level.

Methods

Participants

Participants were four Japanese-speaking mothers living in the United States recruited via Japanese community websites and the mass email system of a Japanese parental support group. The recruitment flyer and consent form (written in Japanese) indicated the purpose of the study was to evaluate the effects of a private online ACT Matrix parent training program on positive behaviors that align with what is important to parents (parenting values), parental engagement in treatment, psychological flexibility, and distress level, and to assess acceptability of this parent training program. Inclusion criteria included (a) grew up and were educated in Japan (up to high school or higher level of education in Japan), (b) used Japanese as their primary language, (c) had at least one child at any age without any known diagnosis residing with them, (d) did not have current psychological or psychiatric care with or without medication, (e) were experiencing psychological destress in the form of depression, anxiety, and stress in parenting at the mild or higher level in any of the three sub-sections of the DASS-21, and (f) scored below 5 of global flexibility and above 3 of global inflexibility of MPFI. Although recruitment was not gender-specific, all respondents who met these criteria identified as mothers. None of the participants had received parent training prior to this study. To maintain confidentiality of their personal information, pseudonyms were used at all times.

Aiko was a married mother to a 5-year-old daughter, was employed, and has been a U.S. resident for 15 years and 3 months at the time of the study. Kazumi was a married, self-employed mother to a 5-year-old daughter and an 8-year-old son and had been a U.S. resident for 18 years and 8 months. Keiko was also a married, self-employed mother with a 15-year-old daughter, an 11-year-old son, and a 7-year-old daughter who had been a U.S. resident for 8 years. Michiko was a married mother to a 15-year-old son, a homemaker, and had been a U.S. resident for 18 years and 11 months.

Sessions were conducted via GoToMeeting videoconference to comply with HIPAA, and all sessions, orientations, training, and debriefing were conducted by the primary researcher, a board-certified behavior analyst (BCBA®) who spoke Japanese as her first language and had been trained in ACT through multiple on-site and remote ACT training workshops by peer-reviewed ACT trainers. In addition, she was a certified ACT Matrix trainer and Prosocial facilitator.

Data Collection

Participants were asked to download an open-source mobile phone application, the Personal Analytics Companion (PACO; Evans, 2014) designed to facilitate ecological momentary assessments (EMA; Bentley et al., 2019). Use of PACO has been documented in other acceptance and mindfulness-based studies assessing emotions, movement-based behaviors, and self-perceptions (e.g., Doorley & Kashdan, 2021;

Krafft et al., 2019; Levin et al., 2017, 2022). This platform allowed the primary researcher to develop a data collection system that monitored daily frequency of value-driven behavior in the context of their daily lives with a captured photo image as a proof. Parents chose a 3-h focus time when they wanted to engage in their value-driven behaviors and collect data. During the focus time, random notifications were programmed to occur five times. These notifications signaled participants to notice their behavior, to discriminate whether they were engaging in their value-driven behaviors or not at that time, and to collect data. In addition, outside of this focus time, participants were instructed to open the app and initiate data collection whenever they noticed themselves engaging in the target behaviors at any time of the day.

Measures

Direct measures

Value-driven behaviors (Toward Moves) This variable was defined as daily occurrences of behavioral topographies that align with what is important to parents (parenting values). Such topographies were behavioral actions that parents wanted to do more through choice-making in the services of their parenting values. Thus, these included behaviors directed toward their children but also ones toward other family members and themselves. Specific topographies within this response class were identified and operationally defined by participants and the primary researcher during the initial orientation session (see Table 2). During baseline, participants started taking frequency data on "toward" or "away" moves in response to random automated prompts from the mobile app and continued doing so throughout this study. They also took and attached a photo of themselves engaging in their value-driven behavior using their smartphones as a permanent product with the time stamp. Once they chose "toward" or "away" and attached a photograph, the data collection for that activity was complete.

Parent engagement This variable was defined as the degree to which the parent actively participated in the research program. Specifically, two variables were measured: (a) session attendance and (b) completion of daily assignments. Session attendance was defined as staying on the screen with the camera and audio on during the session. Percentage of session attendance was calculated by dividing the number of 5-minute intervals with the correct response by the total number of 5-minute intervals of each session multiplied by 100. Completion of daily assignments was defined as the number of responses submitted via the data collection app each day in response to the notifications or spontaneously without notification. The maximum number of daily assignments was set as five. Percentage of daily assignment completion was measured by dividing the number of responses submitted by the total number of daily notifications (i.e., five) multiplied by 100.

Indirect measures

Depression anxiety stress scales 21 (DASS-21; Lovibond & Lovibond, 1995; Mitani et al., 2015) The Japanese translation of the DASS-21 from Mitani et al. (2015) was used to assess three emotional states: depression, anxiety, and stress. Participants rated each subscale with seven items using a 4-point scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*). The final scores for subscales of depression, anxiety, stress range from 0 to 42 (multiply raw score by 2) and categorized into normal (0–9, 0–7, 0–14, respectively), mild (10–13, 8–9, 15–18, respectively), moderate (14–20, 10–14, 19–25, respectively), severe (21–27, 15–19, 26–33, respectively), and extremely severe levels (greater than or equal to 28, 20, 34, respectively). The DASS-21 holds good internal consistency as follows: $\alpha = 0.85$ for depression, $\alpha = 0.73$ for anxiety, and $\alpha = 0.81$ for stress (Mitani et al., 2015).

Multidimensional psychological flexibility inventory (MPFI; Rolffs et al., 2018; Lin et al., 2020) The MPFI is a 60-question survey with 12 psychological flexibility/inflexibility subscales. In this study, the shorter 24-item Japanese-translation version was used (Lin et al., 2020). Participants rated the extent to which they agreed with each item on a 6-point scale (1 = *never true* to 6 = *always true*). Higher averaged scores on the respective global and sub-processes indicate greater psychological flexibility and inflexibility. MPFI has been identified as a valid measure that holds valid precision over time (Rolffs et al., 2018) and demonstrates high levels of internal consistency across cultural groups (from 0.87 to 0.94). The Japanese version holds good internal consistency of $\alpha = 0.89$ and 0.82 for flexibility and inflexibility global composites, respectively, for females (Lin et al., 2020).

Parenting stress index – short form (PSI-SF; Abidin, 1995; Narama et al., 1999) This self-report instrument is comprised of 36 statements related to parenting stress that are rated on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The Japanese translation from Narama et al. (1999) was employed. The 36 items are categorized into three sub-scales: parental distress (PD), parent-child dysfunctional interaction (P-CDI), and difficult child (DC). The total stress score of the three subscales indicates the overall level of stress that a parent is experiencing in their role as a parent. Percentile scores form 90 and above are considered to indicate clinically significant total stress levels. Percentile scores from 85 or higher are

Table 2 Value-driven behavior examples for four parents

Participant	Values	Value-driven behaviors (topographies)	Examples
Aiko	Child, Family, Work	Any instance of Aiko providing daughter or husband with social praise. Any instance of Aiko saying "thank you" to daughter or husband.	During a short break in between work time, noticing daughter drawing something for school and saying, "Wow, that looks great!" Saying "Thank you" when noticing husband taking care of daughter (e.g., preparing lunch for daughter) even if it does not meet her expectations.
Kazumi	Child, Husband, Self, Unconditional love	Any instance of Kazumi using a neutral attitude to deal with child's behavioral difficulties. Any instance of Kazumi spending a relaxing time with family.	Prompting child to reengage in online class when she notices he is distracted, by saying, "Just 10 more minutes, you can do it," instead of saying "What are you doing? Why don't you just quit school?" Taking a walk, doing dishes with child as a fun activity, going to the beach, doing arts and crafts with family.
Keiko	Family, Self, Calm mind, Health	Any instance of Keiko taking care of her own mind and health by engaging in exercise, relying on family members for tasks, or cooking/eating healthy food. Any instance of Keiko engaging in intentional verbal communications with family members by asking for clarifications, clearly stating her needs, or offering suggestions.	Doing yoga, cooking and eating healthy food, asking family members to bring drinks or meals and to take care of each other when she is sick or needs her own time. When husband throws away something that she is saving due to lack of his perspective-taking, telling him clearly, "I know you are helping me with house chores, and I really do appreciate it! And, I am saving this, and it is important to me. So, do not throw it in the trash next time."
Michiko	Child, Child's homework, Mutual understanding, Family, Self	Any instance of Michiko expressing and sharing her thoughts and feelings without worrying about how it will be taken by family members. Any instance of Michiko creating an environment or making statements that helps family members feel relaxed and comfortable.	Telling child that she is worried about his tardiness with "I-statement" such as "I am sad when you talk to me that way," "I think it is better to do…," instead of being quiet or obeying his orders. Cooking favorite dishes for family, driving to beach, giving child a ride to a place where he can focus on homework, taking actions to arrange a tutor's support.

considered to indicate high total stress levels. Scores between the 15 to 80 percentiles are considered as within normal range (Abidin, 1995). The PSI Japanese version holds excellent internal consistency of .94.

Social validity questionnaire A social validity questionnaire was administered to participants at the end of the maintenance phase. This questionnaire consisted of 12-items using a 5-point Likert-rating scale with 1 = strongly disagree, to 5 = strongly agree. An open-ended question was also added as the last item for participants to provide any feedback or comments on this study and their participation experiences. The questionnaire items assessed the level of social validity across the following three areas: cultural sensitivity (e.g., I was able to open up and share my feelings and thoughts more than I would be able to do in English), effectiveness of intervention (e.g., By noticing my own overt and covert behavior and taking action, I felt that my distress level decreased), and acceptability of intervention (e.g., It was easy to take data on the app).

Interobserver Agreement (IOA) and Treatment Integrity

A second observer independently scored interobserver agreement (IOA) for parent value-driven behaviors and parent engagement separately for 33% of sessions for each experimental condition for all participants. To assess IOA on parent values-driven behaviors, a point-by-point comparison was conducted using permanent products (e.g., pictures sent via app) on the occurrence and nonoccurrence of the target behavior. For parent engagement, a point-by point comparison was conducted using a checklist on attendance and assignments completed during each phase. IOA was calculated by dividing the number of agreements by the number of agreements plus disagreements and converting this number into percentage. To assess treatment integrity, a second observer scored the experimenter's implementation of the training videos for 33% of all sessions using the checklist form. Treatment integrity was calculated by dividing the number of steps implemented correctly by the number of correctly and incorrectly implemented steps and multiplying by 100.

Procedures

This study was approved by the study site's Institutional Review Board (IRB), and all participating parents provided written informed consent prior to inclusion in the study. A randomized non-concurrent multiple baseline single-subject design across participants was employed to evaluate the effects of the online ACT Matrix parent training program adapted from the six-step protocol of Polk et al. (2016). This design consisted of baseline, intervention, maintenance, and follow-up probe phases. Following the 1.5-h initial orientation, baseline data collection of value-driven behaviors started via the mobile app. The intervention consisted of three 1.5-h ACT Matrix training sessions conducted across 2 weeks, followed by one week of the maintenance phase. Finally, follow-up probes were collected three times across 11 days. At the end of the study, a brief debriefing meeting (15–20 min) was held. At least 1–2 days prior to each session appointment, a session reminder email/text was sent by the primary researcher. Indirect measures, DASS-21, MPFI, and PSI-SF, were sent out online prior to the orientation session. These three questionnaires were sent out twice during the 2-week intervention phase, once at the end of the maintenance phase along with social validity questionnaire, and once at the end of the follow-up phase.

Cultural sensitivity was ensured through private telehealth modality, modeling of openness and vulnerability, and cultural materials and stimuli. Individual sessions allowed for privacy, flexible scheduling, and prompted break time during session as needed. Throughout the interactions in Japanese, the researcher fostered an open and safe environment by sharing her personal experiences from the same cultural background perspective and appreciating their sharing. Lastly, materials and verbal stimuli related to Japanese cultures, such as Verbal Aikido, and Japanese anime characters and proverbs, for example, were used as they showed up in participants' responses.

Orientation session

After parents signed the informed consent form and completed the three indirect measures, a 1.5-h individual telehealth orientation session was conducted. The objective of this session was to present the purpose, structure, and schedule of the baseline and training sessions to each individual participant. In addition, participants were trained to use GoToMeeting and PACO. Following this introductory preparation, participants identified up to three behavior topographies linked to their parenting values. Participants had the opportunity to practice using the app, taking data, and attaching a photo for each response until they demonstrated competence. They were also informed that they would receive check-in calls (5-10 minutes) or texts twice a week during this study (on approximately the second and seventh day of the app use each week) to provide support and ensure their adherence to the protocol of this study. During check-in calls or texts, the experimenter reinforced the app-usage, established motivation to continue collecting data, and addressed any technical issues and barriers to data collection.

Baseline phase

During this phase, participants started taking daily data on their chosen value-driven behaviors (i.e., confirming behavior engagement and attaching a picture of the specific behavior using the app). This process continued until the primary researcher confirmed data stability with zero trend and limited variability for at least 3 consecutive days. The first training session was scheduled immediately after the end of the baseline phase.

Intervention phase

The intervention protocol was adapted from the ACT Matrix six steps (Polk et al., 2016; adapted online ACT Matrix parent training protocol manual and scripts in Japanese available upon request from the primary researcher). Each of the six steps was organized across three 1.5-hour individual telehealth remote sessions.

Training session 1 This session consisted of two main goals: (1) connecting with parents' experiences and (2) presenting the ACT Matrix- setting up the point of view. First, participants' experiences and difficulties with parenting were explored and validated. Second, the principal researcher introduced the four quadrants of the ACT Matrix. The lower-right quadrant corresponds to stated values, namely appetitive, socially meaningful consequences available only after concerted, long-term effort. The upper right quadrant represents overt behaviors one engages in "toward," or that lead to contacting appetitive consequences. The lower left quadrant represents "away," or aversive, thoughts, emotions, memories, or bodily sensations that an individual engages in covertly. Correspondingly, the upper left quadrant lists overt behaviors that serve to avoid or escape private or public aversive stimuli identified in the lower left quadrant. Five key questions related to each quadrant were presented to the parents to evoke specific verbal descriptions of the "toward" and "away" moves: "Who and what are important to you as a parent?" "What shows up and gets in the way of moving toward who or what is important to you as a parent?" "Who stands at the center of the point of view?" "What are some of the things you do to move away from unwanted inner stuff?" and "What do you do or could you do to move toward who or what is important to you as a parent?" As they answered these questions, each quadrant was filled in with their responses and "noticing me" was later written down in the center of the matrix.

Importantly, participants were prompted to identify and confirm that listed value-driven actions in the upper right quadrant were members of the response class of the value-driven behaviors they had been tracking since the baseline phase through the matrix app. This session concluded by reminding parents to notice their "away" and "toward" moves and collect data throughout their participation in this study, asking parents if they had any questions or comments, appreciating their participation, and then reviewing the next session schedule. Finally, once the session meeting ended, the three indirect measure questionnaires were emailed or texted to parents.

Training session 2 This session consisted of two main goals: (1) teaching parents to understand the effectiveness of "toward" and "away" moves and (2) teaching parents about "hooks" and the problem with control effects. For the first goal, a rating system was implemented to assess the short- and long-term effectiveness of "away" moves from the unwanted inner experiences. The following scale of pluses and minuses was used: highly effective (+++); quite effective (++); somewhat effective (+); no effect (0); makes it somewhat worse (−); makes it significantly worse (– –); and makes it much worse (– – –). To illustrate, if a participant mentioned that watching TV was effective in the long-term at controlling stress, they would rate this as (++ +). The opposite would be rated as (– – –), indicating that it worsened their stress. Once "away" moves were rated on the Matrix, the researcher attached a stuck loop spiral picture and asked whether the participant's "away" moves worked in the short and long-term and their unwanted inner experiences came back. Similarly, participants were asked to rate each "toward" move with the same rating system.

The second goal was teaching participants to notice the unworkability of attempting to control aversive private events (e.g., trying to suppress intrusive thoughts and painful memories). The hook and catch-and-release metaphors were used to teach parents how individuals respond to aversive inner experiences (i.e., hooks) in different contexts and timing, how "not-fighting" and "just noticing" the hook reduces its aversiveness, and how this process results in less "away" moves. For example, when experiencing frustration or irritation, a parent may engage in ineffective, negatively reinforced behaviors, such as shouting at their children. This behavior, if negatively reinforced, is effective only in the moment. Regardless, the frustration and irritation can reemerge at any time in the future. This session ended by asking participants to continue noticing and taking data on their "away" and "toward" moves while paying special attention to hooks that showed up and how they reacted to it and what would happen. The next session schedule was reviewed, and any questions they had were addressed.

Training session 3 This session consisted of three main goals: (1) learning how to use verbal aikido, (2) training self-compassion skills, and (3) harnessing the power of perspective-taking. For the first goal, the strategy consisted

of teaching parents how let go of their control over their negative private experiences and turn "toward" who or what is important to them. For example, the principal researcher randomly asked seven questions related to the participant's experience of avoiding negative private experiences (e.g., "What did you notice with your five senses?" "What hooks did you notice showing up?" "Who or what is important in being able to do this?"). If the participant struggled with specific content (e.g., they did not want to talk about a difficult emotion), the researcher validated their experience and used a strategy called "yessing." The researcher responded with "Yes, and…." phrase to help the participant stay fully present in the moment, validate the participant's feelings, emotions, and sensations, and provide opportunities for parents to discriminate and sort their experiences.

The second goal was training self-compassion skills using the kitten metaphor. Participants were asked to name negative self-judgments and distressing thoughts and emotions; then, they were asked to treat them as kittens in distress. The objective of this exercise was to teach parents how to interact differently with their own aversive private experiences. Rather than avoiding or eliminating these experiences, they were invited to approach, observe, and treat them compassionately, as though these distressing thoughts and emotions were kittens in distress.

The third goal was harnessing the power of perspective-taking. This goal aimed to teach parents to choose a situation in the near future in which they anticipate getting entangled in unpleasant private events or "away" moves, and then inviting them to engage in a dialogue about how their future "self" would engage in "toward" moves. This training session ended by congratulating parents for participating in all three sessions. They were asked to continue noticing and taking data of their "toward" moves while practicing all activities trained in the past sessions. Lastly, links to the three indirect measures were sent to the participants.

Maintenance, follow-up probes, and debriefing

Maintenance data were collected for six consecutive days. Participants continued collecting daily data on their value-driven behaviors uploading pictures through the matrix app. At the end of this phase, online links to the three indirect measures along with the social validity questionnaire were sent to the participants. During follow-up, participants were asked to collect probe data three times across 11 days. Once the third data submission was confirmed, the links to the three indirect measures were sent to participants. After the completion of the three indirect measures, the primary researcher conducted a remote debriefing meeting (15–20 min) with participants. During this meeting, the primary research thanked them for their participation and reviewed the purpose of this study, information on collected data, and how the data would be analyzed and presented with participants. Additionally, participants were encouraged to ask any questions regarding this study.

Data Analysis

A visual analysis reporting level, trend, variability, and immediacy of change and overlap was used to identify a functional relation between the ACT Matrix treatment and value-driven behaviors and ACT Matrix treatment and daily assignment completion. Non-overlap of all pairs (NAP) was used as a measure of effect (Parker & Vannest, 2009) for these two dependent variables. NAP summarizes the pairwise comparisons of all data across two adjacent phases (e.g., baseline and intervention). NAP is calculated by dividing the number of comparisons with no overlap by the total number of comparisons. The effect sizes are identified as a weak effect when NAP scores are in the 0–0.65 range, a moderate effect when NAP scores are in the 0.66–0.092, and a strong effect when NAP scores are in the 0.93–1.0 range (Parker & Vannest, 2009).

To calculate if a participant's change on the three indirect measures, DASS-21, MPFI, and PSI-SF, was reliable and large enough to be regarded as statistically significant, we employed the reliable change index (RCI; Jacobson & Truax,1991). The RCI was calculated between the baseline-intervention, intervention-maintenance, and maintenance-follow-up. RCIs were calculated by subtracting the participant's post-treatment score from the pre-treatment score and dividing by the standard error of difference (S_{diff}) of the questionnaire, with the formula $RCI = x_1 - x_2/S_{diff}$ and $S_{diff} = \sqrt{2}(SEM)^2$. Since the outcomes are z-scores, they are significant if $z < -1.96$ or $z > 1.96$.

Results

Value-Driven Behavior (Toward Moves)

As shown in the Fig. 2, all participants increased their frequency of value driven behavior, thus supporting the hypothesis across all four participants. Aiko's daily frequency of value-driven behaviors during baseline was relatively stable at a low level ($M = 1.6$, range 1–2). Upon the introduction of the first training session, her value-driven behaviors showed a relative improvement followed by a decrease back to the baseline level. Following the second training session, she exhibited a significant increase followed by slightly decreasing trend. A small increase was observed on the third session day. Overall, the average frequency of value-driven behaviors during intervention increased compared to baseline ($M = 3.6$, range 1–7).

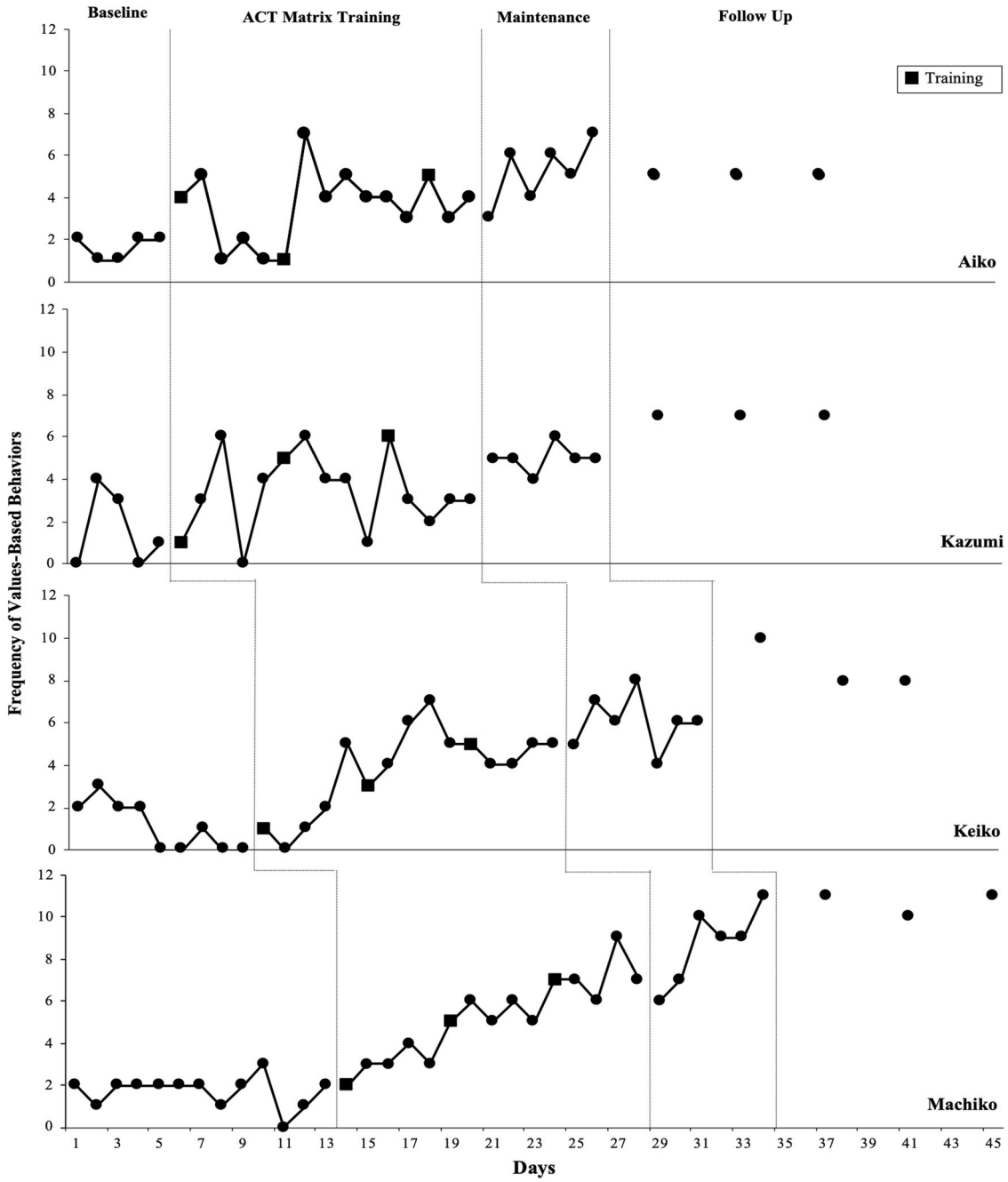

Fig. 2 Value-driven behaviors across all participants

However, during the maintenance phase, a rapidly accelerating trend with mild variability was observed ($M = 5.2$, range 3–7). Finally, follow-up data showed a slight decrease and stayed at the same level across the three probe data points ($M = 5$, range 5–5).

Kazumi's baseline level of value-driven behavior was relatively low with high variability ($M = 1.6$, range 0–4). Upon completion of the first training session, a rapid increasing trend occurred followed by a sudden decrease to zero level and an immediate increasing trend in the next 2 days. Value-driven behaviors continued exhibiting an increasing trend after the completion of second training session. However, a sudden drop was observed in the next 3 days. Right before the last training session, another increase in value-driven behaviors was noted, followed by a sudden drop in the next 2 days. Overall, the average frequency of value-driven behaviors during intervention ($M = 3.4$, range 0–6) increased compared to baseline.

During the maintenance phase, value-driven behaviors remained at a higher level compared to the intervention phase ($M = 5$, range 4–6). The follow-up phase showed a higher increase across the three probe data points ($M = 7$, range 7–7).

Keiko's baseline level exhibited a gradual decrease trend ($M = 1.1$, range 0–3). Data showed an increasing trend after the first intervention session with a minor drop towards the end of this phase. Upon introduction of the second training session, another rapid acceleration trend occurred followed by a slight decrease in level for the rest of the phase. During the last training phase, data showed minor response variability. Overall, the average frequency of value-driven behaviors during intervention ($M = 3.8$, range 0–7) increased compared to baseline. During the maintenance phase, an immediate increase in level was observed and maintained at high levels with moderate variability throughout the phase ($M = 6$, range 4–8). During the follow-up phase, an additional increase was noted across the three probe data points ($M = 8.7$, range 8–10).

Michiko's baseline data demonstrated a stable responding at a low level throughout this phase ($M = 1.7$, range 0–3). Upon introduction of the first intervention session, there was an overall rapid accelerating trend with mild variability throughout the phase. Additionally, over the following two training sessions, an increase in level was observed. Overall, the average frequency of value-driven behaviors during intervention ($M = 5.2$, range 2–9) increased compared to baseline. A slight decrease occurred upon the introduction of the maintenance phase, followed by a rapid increasing trend throughout the rest of this phase ($M = 8.7$, range 6–11). Value-driven behaviors remained at high levels across the three follow-up probe data points (M = 10.5, range 10–11).

Effect size for value-driven behavior was also measured. Table 2 shows the results of a nonparametric analysis of nonoverlap of all pairs (NAP; Parker & Vannest, 2009) for value-driven behaviors. Results demonstrated moderate effects (ranging from 0.75 to 0.82) from baseline to intervention for Aiko, Kazumi, and Keiko, whereas a strong effect of the intervention was identified for Machiko (0.97). From intervention to maintenance, results indicated moderate effects (ranging from 0.76 to 0.90) across all participants. Lastly, from maintenance to follow-up, data showed a weak effect for Aiko (0.42), moderate effects for Kazumi and Keiko (0.77 and 0.82, respectively), and a strong effect for Machiko (0.82). In sum, effect size data showed a moderate to strong effect from baseline to intervention for all participants. Furthermore, moderate levels were observed for all participants from intervention to maintenance, and moderate to strong levels for three participants from maintenance to follow-up.

Parent Engagement

Each participant stayed in front of their computer screen with the camera and audio on during the online videoconferencing meetings across all phases (100% session attendance). Figure 3 displays increased percentages of daily assignment completion for all participants from a low baseline score to 100%. For Aiko, after the low percentage during baseline ($M = 28$, range 20–40), the level of percentage increased to a high level with moderate variability during the training phase ($M = 68$, range 20–100). During maintenance, the high level was maintained with a gradual increase trend ($M = 90$, range 60–100). Follow-up data showed 100% across three probes. For Kazumi, baseline data showed a high variability at low to moderate levels ($M = 32$, range 0–80). The high variability continued during the training phase with an overall increase ($M = 64$, range 0–100). Daily assignment completion increased considerably with a low variability during the maintenance phase ($M = 97$, range 80–100), followed by three 100% follow-up probe data points.

Keiko's baseline data showed a decreasing trend ($M = 22$, range 0–60), followed by the rapid increasing trend throughout the training phase ($M = 72$, range 0–100). During maintenance, assignment completion level stayed at the high level with limited variability ($M = 97$, range 80–100). Follow-up data showed 100% across three probe data points. Lastly, for Machiko, baseline data were at low to moderate levels with moderate variability ($M = 34$, range 0–60), followed by a steep increasing trend during the training phase ($M = 87$, range 40–100). 100% level was maintained across the maintenance and follow-up phases ($M = 100$).

The NAP results for daily assignment completion demonstrated moderate to strong effects from baseline to intervention (see Table 3). The moderate effects (ranging from 0.73 to 0.86) were observed for three participants, Aiko, Kazumi, and Keiko, while a strong effect (0.93) was observed for Machiko. From intervention to maintenance, moderate effects (ranging from 0.71 to 0.83) were observed for the same three participants, while a weak effect (0.61) was observed for Machiko. From maintenance and follow-up, a moderate effect (0.67) was observed for Aiko, and weak effects (ranging from 0.50 to 0.58) were observed for the other three participants. Similar to value-driven behaviors, effect size data suggest the intervention was effective for all participants at moderate and strong levels. Comparisons between the intervention and maintenance phases indicated moderate effect for three participants. Weak effects were observed for all participants from maintenance to follow-up.

Indirect Measures

Table 4 shows the RCI scores between the different measurement moments of the DASS-21, MPFI, and

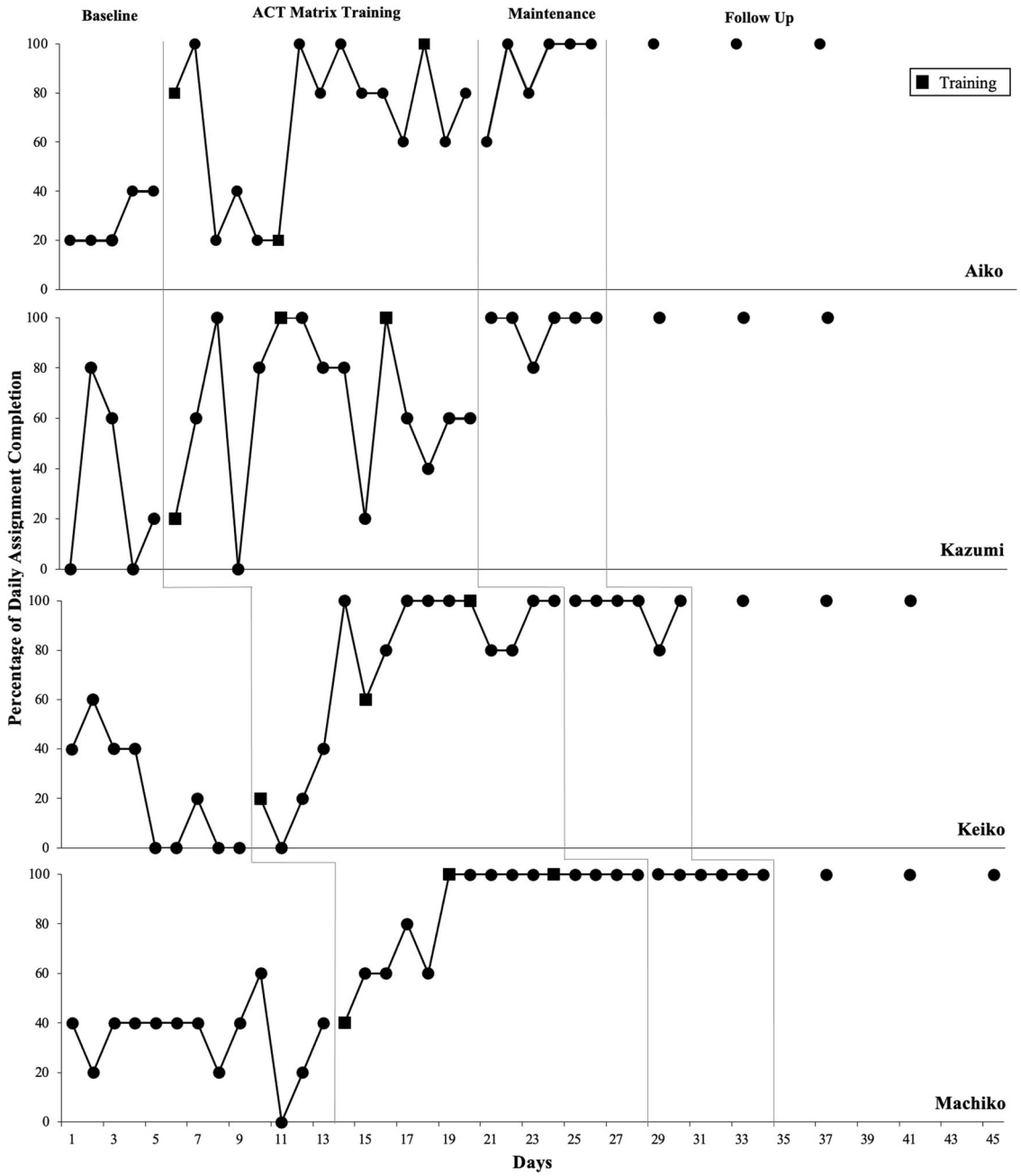

Fig. 3 Daily assignment completion for all participants

PSI-SF (significant if $z < -1.96$ or $z > 1.96$). Analyses on the DASS-21 scores showed that all four participants demonstrated statistically significant improvement in depressive symptoms from baseline to intervention, and Keiko and Machiko showed significant improvement from intervention to maintenance. In the anxiety scale, Aiko, Kazumi, and Machiko demonstrated statistically significant improvement from baseline to intervention, and Kazumi and Keiko showed significant improvement from the intervention to maintenance. In the stress scale, Kazumi, Keiko and Machiko demonstrated statistically significant improvement from baseline to intervention, and Aiko and Keiko demonstrated significant improvement from intervention to maintenance. MPFI flexibility global composites scores revealed significant improvement from baseline to intervention phase in Kazumi and Keiko, whereas Machiko showed significant improvement from maintenance to follow-up phase. MPFI inflexibility global composites scores indicated that Kazumi, Keiko, and Machiko improved significantly from baseline to

Table 3 Effect size for value-driven behaviors and daily assignment completion

	Value-driven behaviors					Daily assignment completion				
Participant	NAP Est	Effects	SE	Cl_lower	Cl_upper	NAP Est	Effects	SE	Cl_lower	Cl_upper
	Baseline to Intervention					Baseline to Intervention				
Aiko	0.82	Moderate	0.09	0.52	0.94	0.81	Moderate	0.10	0.51	0.94
Kazumi	0.75	Moderate	0.13	0.46	0.91	0.73	Moderate	0.13	0.44	0.90
Keiko	0.86	Moderate	0.07	0.62	0.95	0.86	Moderate	0.07	0.62	0.95
Michiko	0.97	Strong	0.03	0.80	0.99	0.93	Strong	0.06	0.75	0.98
	Intervention to Maintenance					Intervention to Maintenance				
Aiko	0.76	Moderate	0.12	0.48	0.91	0.74	Moderate	0.11	0.46	0.90
Kazumi	0.77	Moderate	0.10	0.49	0.91	0.83	Moderate	0.08	0.55	0.94
Keiko	0.82	Moderate	0.10	0.54	0.94	0.71	Moderate	0.10	0.43	0.88
Michiko	0.90	Moderate	0.07	0.63	0.98	0.61	Weak	0.06	0.36	0.81
	Maintenance to Follow-Up					Maintenance to Follow-Up				
Aiko	0.42	Weak	0.21	0.14	0.77	0.67	Weak	0.17	0.29	0.90
Kazumi	1.00	Strong	0.05	1.00	1.00	0.58	Weak	0.17	0.23	0.86
Keiko	0.94	Strong	0.08	0.52	1.00	0.58	Weak	0.17	0.23	0.86
Machiko	0.86	Moderate	0.13	0.44	0.98	0.50	Weak	0.16	0.18	0.82

Effect size across phases. Weak effect: 0–0.65; Moderate effect: 0.66–0.92; Strong effect: 0.93–1.00

intervention. Keiko continued to show significant improvement from intervention to maintenance phase. Finally, the PSI-SF full score revealed that Kazumi demonstrated statistically significant improvement from baseline to intervention.

Social Validity Questionnaire

Overall, all participants considered this treatment model culturally sensitive, effective, and acceptable at high levels. First, all participants scored 5 (*strongly agree*) for two questions related to cultural sensitivity of this study. Second, for the area of effectiveness of intervention, all participants answered five questions and scores ranged from 3–5 with the mean range of 4.25 to 4.75. Third, participants reported that this online training was easy to attend, and training duration was acceptable especially. The scores ranged from 4–5 with the mean range of 4.75 to 5 (Table available as supplementary material). Lastly, in response to the open-ended question that solicited their feedback and comments, participants provided positive responses such as "The practice of accepting my own negative feelings and emotions made me strong and kind as a parent," "Learning to orient my attention to my values empowered me," "This training made it so easy for me to visually identify my own thoughts and feelings (mind) and how they affect me," and "I have learned to be compassionate toward my inner-self and less reactive to challenges in parenting and life during this COVID pandemic in a foreign country." Overall, participants considered this study highly culturally sensitive, effective, and acceptable.

Interobserver Agreement (IOA) and Treatment Integrity

Results showed IOA was 100% for parent value-driven behaviors, session attendance, and daily assignment completion across all parents. Treatment integrity for ACT Matrix implementation was also 100%.

Discussion

The purpose of the current study was to evaluate the effects of an online ACT Matrix parent training program adapted from the six-step protocol delivered via videoconferencing on overt value-driven behaviors, parental engagement, parental distress, and psychological flexibility, and to assess social validity of the training with Japanese-speaking parents with children without known diagnoses in the U.S. Results of this study demonstrated that the individual online ACT Matrix parent training program was effective in improving value-driven behaviors across all participants. These results are consistent with previous ACT studies with single-subject designs (Andrews et al., 2021; Gould et al., 2018) and group designs studies (Byrne et al., 2021; Han et al., 2021). However, there are some significant differences between this study and previous studies.

First, to our knowledge, this is the first study to evaluate the effectiveness of the comprehensive ACT Matrix training model. Previous research (e.g., Gould et al., 2018) employed the ACT Matrix as a component of the training sessions, whereas in the current study, the ACT Matrix six-

Table 4 Mean scores for indirect measures and reliable change index scores across participants

	Aiko		Kazumi		Keiko		Machiko	
	M	*RCI*	*M*	*RCI*	*M*	*RCI*	*M*	*RCI*
DASS-21 - Depression								
Baseline	24		14		30		32	
Intervention (RCI prebaseline/intervention)	18	(2.86*)	3	(5.24*)	22	(3.81*)	19	(6.20*)
Maintenance (RCI intervention/maintenance)	20	(−0.95)	2	(0.48)	0	(10.49*)	12	(3.34*)
Follow-Up (RCI maintenance/follow-up)	18	(0.95)	0	(0.95)	0	(0.00)	14	(−0.95)
DASS-21 – Anxiety								
Baseline	22		10		20		16	
Intervention (RCI prebaseline/intervention)	16	(2.97*)	4	(2.97*)	20	(0.00)	5	(5.44*)
Maintenance (RCI intervention/maintenance)	14	(0.99)	0	(1.98*)	0	(9.90*)	10	(−2.47)
Follow-Up (RCI maintenance/follow-up)	14	(0.00)	0	(0.00)	0	(0.00)	8	(0.99)
DASS-21 - Stress								
Baseline	28		32		38		24	
Intervention (RCI prebaseline/intervention)	29	(−0.42)	9	(9.67*)	23	(6.30*)	15	(3.78*)
Maintenance (RCI intervention/maintenance)	24	(2.10*)	6	(1.26)	4	(7.98*)	14	(0.42)
Follow-Up (RCI maintenance/follow-up)	22	(0.84)	6	(0.00)	0	(1.68)	14	(0.00)
MPFI – Flexibility								
Baseline	3		2.9		3.6		4.1	
Intervention (RCI prebaseline/intervention)	3.9	(−1.79)	4.2	(−2.58*)	5.1	(−2.98*)	3.2	(1.79)
Maintenance (RCI intervention/maintenance)	3.4	(0.99)	5.1	(−1.79)	5.9	(−1.59)	3.7	(−0.99)
Follow-Up (RCI maintenance/follow-up)	3.6	(−0.40)	5.7	(−1.19)	5.8	(0.20)	4.7	(−1.98*)
MPFI – Inflexibility								
Baseline	3.8		4.5		5.2		4.8	
Intervention (RCI prebaseline/intervention)	3.3	(1.02)	3.0	(3.05*)	2.7	(5.08*)	3.3	(3.05*)
Maintenance (RCI intervention/maintenance)	3.3	(0.00)	2.1	(1.83)	1.0	(3.46*)	3.0	(0.61)
Follow-Up (RCI maintenance/follow-up)	3.6	(−0.61)	2.3	(−0.41)	1.6	(−1.22)	3.3	(−0.61)
PSI-SF								
Baseline	124		105		77		105	
Intervention (RCI prebaseline/intervention)	130.5	(−0.67)	81	(2.30*)	90.5	(−1.34)	121.5	(−1.63)
Maintenance (RCI intervention/maintenance)	136	(−0.48)	63	(1.73)	94	(−0.29)	131	(−0.86)
Follow-Up (RCI maintenance/follow-up)	124	(1.15)	74	(−1.06)	95	(−0.1)	112	(1.82)

DASS-21 The depression, anxiety and stress scale-21, *MPFI* Multidimensional psychological flexibility inventory, *PSI-SF* Parent stress index – short form, *RCI* Reliable change index

Table includes raw scores with the reliable change index between brackets. Asterisk (*) indicates statistically significant change. Significant if $z < -1.96$ or $z > 1.96$

step protocol was adapted and implemented comprehensively. The ACT Matrix was presented and utilized throughout the training sessions for participants to sort their verbal stimuli and covert private events as they engaged in activities (i.e., multiple-exemplar training on discrimination and sorting of those stimuli). Second, this is the first ACT Matrix study that we are aware of that supports parents with children without any known diagnoses or at risk as a preventive measure of child neglect, social withdrawal of parents and children, and coercive parent-child interactions. Third, although previous studies have been conducted with Japanese participants (Muto et al., 2011; Takahashi et al., 2020), this is the first one to target value-driven behaviors of distressed Japanese parents. Furthermore, in this study, the ACT treatment was implemented with a racial minority, Japanese immigrants with language and cultural barriers in the U.S. Lastly, this study was completed via videoconferencing, indicating that the ACT Matrix parent training program can be effectively delivered through telehealth by overcoming geological (time and distance) and financial constraints (see McMillan et al., 2020; Yi & Dixon, 2021 for similar results).

Visual analyses showed significant improvement on daily assignment completion as part of parent engagement

across all participants from baseline to follow-up. The observed weak effect size on daily assignment completion from maintenance and follow-up indicates the ceiling effect where all participants met and maintained the 100% criterion. Such results contribute to the current online ACT and parent training literature (e.g., Andrews et al., 2021; McMillan et al., 2020; Yi & Dixon, 2021). In addition, all participants demonstrated 100% session attendance across orientation, training, and debrief and progressively increased their daily assignment completion levels to 100%. These findings are particularly important given that attrition rates are commonly high in parent training programs (26%; see Chacko et al., 2016).

Possible explanations for this notable positive effect are several. First, cultural sensitivity was ensured within one-on-one private training via telehealth that also provided scheduling flexibility and a non-judgmental, private safe space that facilitated dynamic interactions with the therapist and their inner-selves. Second, technology-enhanced training positively affected the engagement (Corralejo & Rodriguez, 2018; Flujas-Contreras et al., 2019; Levin et al., 2017, 2022; Yi & Dixon, 2021). Daily reminders for assignments increased the salience of and support for parent assignment completion in the context of the participants' everyday lives, increasing their motivation to engage in sessions and complete assigned tasks (i.e., motivation operations), decreasing response effort in completing tasks, and indirectly increasing rapport with the therapist (see Allen & Warzak, 2000).

Parents' psychological flexibility and inflexibility also improved as evidenced in the MPFI scores, and their distress levels decreased progressively throughout all the experimental phases as evidenced in the improved DASS-21 scores (see Fung et al., 2018; Gould et al., 2018; Prevedini et al., 2020; Whittingham et al., 2019 for similar results). In other words, negative association between psychological flexibility levels and parental distress levels was observed (Fonseca et al., 2020). This finding in the reductions in distress is crucial; effects of the ACT Matrix parent training potentially decrease the risk for child-maltreatment, such as mental abuse, neglect, and physical violence.

That said, it is noteworthy that the PSI-SF mean total stress scores remained at the same clinically significant level, except for one participant (Kazumi), throughout this study. This result is also consistent with previous literature on ACT-based interventions and parent training (see Byrne et al., 2021; Garcia et al., 2021 for systematic reviews). Two factors may explain the significant discrepancy in stress scores between DASS-21 and PSI-SF. First, the PSI-SF measures stress levels specifically in a parent-child relationship, rather than the general distress level measured by the DASS-21. Second, it is plausible to say that verbal stimuli and covert private events related to parenting transferred their functions from aversive to neutral stimuli through multiple exemplar training of the ACT Matrix processes. Said differently, parents continued reporting the same stress level related to their children throughout the study; however, such verbal statements and private events no longer triggered their flight-or-flight responses (experiential avoidance) or depressive symptoms. Through this training, parents were contacting such stimuli at the same level or higher frequency as before, while accepting and being flexible about having those private events. In other words, the level of believability and discomfort of such thoughts and feelings decreased (Bach & Hayes, 2002; Hayes, 2004a, 2004b; Levin et al., 2013).

All participants reported that they appreciated the level of cultural and linguistic sensitivity ensured within this study, indicating that the individual online ACT Matrix parent training program via videoconference was culturally and socially valid, effective, and acceptable. Specifically, cultural sensitivity was embedded in the following ways. First, the high privacy via telehealth videoconferencing with scheduling flexibility met the participants' cultural needs and alleviated biases and stigma (Yuen et al., 2013). Second, all training material, instructions, and communications were provided in Japanese, rather than in English. This significantly improved the understanding of the material and client-therapist relationship (Sivaraman & Fahmie, 2020; Slim & Celiberti, 2021; Van Mourik et al., 2017). Third, training sessions included culture-specific content and images, such as Aikido, (Japanese martial arts), Japanese anime characters, and Japanese metaphors and sayings. Such exercises facilitated understanding of this ACT Matrix procedure (see Masuda, 2014), leading to high engagement with no attrition (Chacko et al., 2016; Weisenmuller & Hilton, 2021).

Limitations and Recommendations

Several limitations of the study should be noted. First, participants represented a small number of mothers within a narrowly defined culture. As such, future research is needed that includes mothers, fathers, and other caregivers who rear children with or without a known diagnosis or health condition across diverse cultures, languages, races, ethnicity, and regions of the world utilizing videoconferencing technologies. Second, although the recruitment was public and any parent who met the inclusion criteria could participate, no fathers or caregivers with adult children contacted the researcher. Future research would benefit from investigating factors that contributed to this recruitment result for future outreach effort to diverse groups of parents. Third, this is the first single-subject design research that evaluated the effects of this online ACT Matrix parent training program.

Due to the small sample size, internal consistency of indirect measure scores was not calculated. As such, future research will need to evaluate the effects via randomized controlled trials with a large N to identify its effect statistically compared to a control group (waitlist group) as well as internal consistency within each sample group.

Fourth, parents anecdotally reported collateral and reciprocal behavior changes between themselves and their children during remote videoconferencing sessions and via comment sections of the social validity questionnaire. Such changes included the perceived reduction of child's challenging behaviors and increase in their positive behavior over the course of the study. Specifically, such positive behavior changes of children included increased conversations with empathetic statement toward parents and self, offering help, and willingly completing academic tasks and chores despite the fact that parents did not receive any specific parent training or behavioral management skills to decrease challenging behavior or increase positive behavior of their children. As such collateral behavior changes are valuable outcomes, future research that measures child behaviors is warranted.

Fifth, some data variability in value-driven behaviors during the training phase was observed for two participants (Aiko and Kazumi). Three specific environmental factors seemed to account for these fluctuations. First, Aiko's work schedule changed, limiting her time with her child or for herself on several days. Second, Kazumi's child engaged in severe challenging behavior at an early stage of the intervention phase. Lastly, Kazumi's value-driven behavior lasted for a long duration (e.g., spending quality time with children at the beach for an entire day) and counted as one instance for the day. Future research will benefit from exploring a more efficient and effective EMA procedures and measurement system (e.g., Flujas-Contreras et al., 2019) that collects and evaluates data on parental value-driven behaviors, considering such contextual variables that may change across time. Lastly, there were some situations where parents demonstrated emotional responses with tears during the remote training sessions. As such, future research could benefit from identifying scope of competence as prerequisite skills and knowledge and training required for the implementors of this adapted ACT Matrix parent training program.

Conclusions

In the current systems of education, welfare, and medicine in the U.S., social and healthcare support for parents is rarely offered unless parents seek such help, their children are identified to have diagnoses or disabilities, parental abuse or neglect is reported, and/or side effects of these are manifested as societal needs. However, for Asian American immigrant parents, cultural biases, stigma, language, and socio-economic barriers often inhibit them from reaching out to mental and social service professionals and adhering to proposed treatments that alleviate their parental distress. Moreover, the stereotyping of the model minority and increased anti-Asian discrimination during and after the COVID pandemic are magnifying their challenges, social isolation, and parental burnout. With the rapidly increasing number of Asian American immigrants in the U.S. and globalization, communities must have culturally sensitive, effective, and acceptable treatments available for this growing population as societal preventive measures and must be ready for an expectable rapid increase in such needs and mental and behavioral health disparities.

The current study demonstrated an efficacy of one promising intervention strategy to overcome such barriers with cultural sensitivity and compassion for one specific minority population in the U.S. More research should be conducted with diverse groups of racial minorities across the world by translating this online ACT Matrix parent training program protocol and ensuring cultural sensitivity for each specific group. Further, adapting this individual online treatment model to a small group model may help create a supportive safe space that nurtures a sense of connection and belonging within the minority group, overcoming geological boundaries and financial and emotional burdens.

Data availability

Materials, training program protocol, and the data that support the findings of this study are available from the corresponding author upon reasonable request.

Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Ethics Approval All procedures performed in this study involving human participants were in accordance with the ethical standards of Institutional Research Committee of The Chicago School of Professional Psychology and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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