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Development of a brief online intervention to address aggression in the context of emotion-related impulsivity: Evidence from a wait-list controlled trial

Sheri L. Johnson[a,*], Mackenzie Rae Zisser[a], Devon B. Sandel[a], Benjamin A. Swerdlow[a], Charles S. Carver[b], Amy H. Sanchez[a], Ephrem Fernandez[c]

[a] University of California Berkeley, USA
[b] University of Miami, USA
[c] University of Texas San Antonio, USA

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ABSTRACT

Trait-like tendencies to respond impulsively to emotion, labelled emotion-related impulsivity, are robustly related to aggression. We developed and tested an online intervention to address emotion-related impulsivity and aggression. The 6-session intervention focused on behavioral techniques shown to decrease arousal and aggression, supplemented with implementation intentions and smartphone prompts to facilitate skills transfer into daily life. First, we piloted the intervention in-person with 4 people. Then, 235 participants were randomly assigned to take the online intervention immediately or after a wait-list period; those in the waitlist were then invited to take part in the intervention. Participants completed the self-rated Feelings Trigger Action Scale to assess emotion-related impulsivity, the interview-based Modified Overt Aggression Scale and the self-rated Buss Perry Aggression Questionnaire. Participants who took part in the treatment completed daily anger logs. Attrition, as with other online programs, was high; however, treatment completers reported high satisfaction, and outcomes changed more rapidly during treatment than waitlist across all key outcome indices. In analyses including all participants who took part in the treatment (immediate or delayed), we observed moderate-to-large treatment gains, which were maintained as of the 3-month follow-up assessment. This work supports the usefulness of an intervention for addressing emotion-related impulsivity and aggression.

Violence is a serious public health concern. In the United States alone, 1,723,515 persons were treated in emergency departments for injuries related to assaults in 2012 (CDC, 2014). In data from 133 countries, the World Health Organization (2014) estimated that 475,000 persons died from homicide in 2012. Children, women, and the elderly are disproportionately likely to experience violence, and it is estimated that 30% of women worldwide have been physically or sexually abused by a partner (WHO, 2014). People injured by violence can experience long-term physical and mental health consequences, which can, in turn, influence social and economic outcomes (Lindert & Levav, 2015).

Beyond social context variables such as poverty and parenting style (Barnow & Freyberger, 2003), a substantial literature focuses on individual differences that shape the propensity to engage in aggression, which may be more amenable to intervention. More specifically, a large body of work focuses on impulsivity. Impulsivity is an umbrella concept with diverse facets that relate differentially to outcomes (Whiteside & Lynam, 2001). One form of impulsivity of particular relevance to aggression is emotion-related impulsivity, defined as the tendency to respond to states of heightened emotion with rash behavior (Whiteside & Lynam, 2001). The most common measure of emotion-related impulsivity is the factor-analytically derived Negative Urgency scale, which measures lack of control over responses to mostly negative affective states (Whiteside & Lynam, 2001). The parallel Positive Urgency scale captures lack of control over responses to positive affective states (Cyders et al., 2007). Emotion-related impulsivity can be manifested in difficulties with a broad range of rash behaviors, including gambling, eating symptoms, self-harm, and alcohol and drug use (Berg et al., 2015).The Urgency scales are robustly related to aggression, and the effects appear to be larger than those observed for some other forms of

* Corresponding author. Department of Psychology, University of California Berkeley, Mail Code 2010, Berkeley Way West Room 3302, 2121 Berkeley Way, Berkeley, CA, 94720-2010, USA.
E-mail address: sljohnson@berkeley.edu (S.L. Johnson).

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impulsivity, such as sensation-seeking (Berg et al., 2015; Bresin, 2019). Emotion-related impulsivity is related to intermittent explosive disorder, sexual assault, physical violence, and intimate partner violence (Derefinko et al., 2011; Dvorak et al., 2013; Mouilso et al., 2016; Puhalla et al., 2016). Effects are observed with interview-based (Bousardt, Hoogendoorn, Noorthoorn, Hummelen, & Nijman, 2016) and laboratory measures of aggression (Scott et al., 2015), and across student, community, and clinical samples (Hoptman et al., 2014; Johnson & Carver, 2016; Lynam & Miller, 2004). Emotion-related impulsivity is modestly correlated with proactive aggression (enacted in service of a desired outcome), but more robustly related to reactive aggression (which occurs in response to anger; Lynam & Miller, 2004). The effects do not appear to just reflect negative affectivity, in that the Positive Urgency scale, $r = 0.34$, shows even more robust links with aggression than does the Negative Urgency scale, $r = 0.24$ (Bresin, 2019). Taken together, findings indicate that the link between emotion-related impulsivity and aggression generalizes across a range of populations.

Our goal in this study was to develop and test an intervention to address aggression in the presence of emotion-related impulsivity. Relatively little work has focused on treatment of emotion-related impulsivity; however, one recent study found that emotion regulation training reduced Urgency levels in a general classroom setting (Zapolski & Smith, 2017). Our aim was to consider whether we could reduce emotion-related impulsivity and a co-occurring clinical concern—aggression.

Medications are often used to manage aggression, including antidepressants, antipsychotics, and antiepileptics. Medications appear helpful for some, with as many as 46% of those with intermittent impulsive disorder showing at least partial remission with antidepressant medication treatment (Coccaro et al., 2009). Nonetheless, findings regarding antidepressants have been mixed. Despite clinical recommendations for antiseizure medication use (Stanford et al., 2009), antiseizure and antipsychotic medications have shown small, non-significant effects compared to placebo across trials (Jones et al., 2011; van Schalkwyk, Beyer, Johnson, Deal, & Bloch, 2018), with no systematic difference by diagnosis.

Turning to psychological approaches, a meta-analysis of almost 100 studies concluded that psychological treatments targeting anger, including psychodynamic, behavioral, and other approaches, were largely successful ($d = 0.76$) and outperformed psychoeducation alone ($d = 0.37$). Aggression is, however, a more difficult treatment target than subjective anger, with much weaker and more varied outcomes of treatment on scales such as the STAXI Anger Expression scale ($d = 0.18$ to 0.61; Saini, 2009). Nonetheless, positive effects have been obtained for reducing aggressive responses to anger even in institutionalized populations (Hollin & Bloxsom, 2007); Novaco, 2013). Cognitive behavioral treatment is the most common psychological approach to the management of anger and aggression, with well-developed therapist manuals (see Kassinove and Tafrate, 2002) and positive effects (Del Vecchio & O'Leary, 2004).

Despite their relative success, there is reason to suspect that the cognitive strategies taught by these approaches, such as perspective taking or reappraisal of the anger-inducing situation, may be difficult for people high in emotion-related impulsivity because emotion-related impulsivity has been tied to poor cognitive control (Cyders & Coskunpinar, 2012; Johnson et al., 2016; Wilbertz et al., 2014), particularly during states of high arousal (Pearlstein et al., 2019). Reappraisal requires high levels of cognitive control, which may help explain why high Urgency scores predict poor response to standard cognitive therapies across studies (Hershberger et al., 2017). Accordingly, several authors have called for the development of interventions for those with emotion-related impulsivity (Hershberger et al., 2017; Zapolski & Smith, 2017).

Our goal then was to use behavioral strategies. Given that emotion-related impulsivity involves problems during states of arousal, our first goal was to provide relaxation training, which has been shown to produce moderate effective sizes for reducing aggressive behavior across studies ($d = 0.67$; Lee & DiGiuseppe, 2018). Because relaxation therapy alone was unsuccessful for about one-third of anger treatment participants and even less helpful for aggression outcomes (Saini, 2009), we supplemented relaxation with self-monitoring and implementation intentions.

To improve the sustained enactment of behavioral coping, we taught participants to use implementation intentions (Gollwitzer & Sheeran, 2006). An implementation intention can be thought of as an "if-then" plan, in which a person decides in advance on a behavior or strategy (e.g., relaxation) to execute in a given context (e.g., when angry) (Gollwitzer & Sheeran, 2006). People often report that they want to avoid engaging in aggressive behavior and yet have difficulty doing so. This fits with a large body of evidence that simply setting a goal of behavioral change is not enough to attain the goal (Gollwitzer & Sheeran, 2006). Of import given that emotion-related impulsivity is tied to cognitive control deficits, implementation intentions require little cognitive control to execute once they are formed (Gallo et al., 2009), and have been successful in populations with deficits in cognitive control, including persons with brain damage (Lengfelder & Gollwitzer, 2001).

Studies support the efficacy of using implementation intentions to address emotion dysregulation (Webb, Gallo, et al., 2012; Webb & Sheeran, 2006) and impulsive behaviors, such as risky sexual behavior (Webb & Sheeran, 2006) and gambling in response to states of high emotion (Webb, Sheeran, et al., 2012). Consistent with research showing that making plans for coping can help for anger reduction (Deffenbacher & Stark, 1992), implementation intentions have also been shown to help improve the use of coping responses to anger among college students (Schweiger Gallo et al., 2018). Accordingly, our treatment approach uses implementation intentions to bolster well-validated behavioral approaches to aggression.

We developed our program to be offered online to help overcome barriers to accessing psychological assistance, including cost and time. Data from the National Comorbidity Survey Replication study indicates that of persons who reported recurrent and diagnosable problems with aggression, only 11.77% had received aggression treatment in the past year, and only one-third had received such treatment in their lifetime (Kessler et al., 2006). This suggests that treatment needs to be more accessible. Web-based mental health programs have shown immediate and long-term benefits for a range of mental disorders (Griffiths et al., 2010), including anger and aggression (Howie & Malouff, 2014).

Here we provide feasibility and pilot data for an online intervention targeting aggression driven by emotion-related impulsivity. We hypothesized that participants who took the treatment would show significant larger decreases in emotion-related impulsivity, self-rated aggression and interviewer-rated aggression from baseline to treatment follow-up than those observed during the wait-list period, and that these improvements in aggression and emotion-related impulsivity would be sustained at 3-month follow-up. We also conducted exploratory analyses to examine whether daily self-monitoring logs showed decreases in peak anger intensity during the treatment and from treatment to follow-up.

1. Method

The study was approved by the ethics board of the university before data collection began. Potential participants completed informed consent. We received a certificate of confidentiality from the National Institute of Health. Data were collected from July 2016 to August 2018. Hypotheses and measures were described specifically in a grant proposal but were not pre-registered. A previous report details outcomes for a subset of 13 participants (Johnson et al., 2020).

1.1. Participants

Participants were recruited through online (e.g., targeted facebook ads, reddit and self-help forums), radio, and print advertising, and through advertisements sent to support groups and community clinics. Advertisements asked, "Would you like help coping with your anger?", noted the availability and timing of the program, and provided a link for screening and information.

Inclusion criteria were recurrent problems with verbal or physical aggression and high scores on a measure of emotion-related impulsivity. More specifically, potential participants completed self-report questions online to assess inclusion criteria of age 18–70; score on Anger, Physical aggression, or Verbal aggression BPAQ subscales at least one standard deviation above normative means (measures described below); Feelings Trigger Action impulsivity score at least one standard deviation above the normative mean; and commitment to change, indicated by willingness to sign a contract to take part in treatment. Exclusion criteria, also assessed online, included conditions that could interfere with behavioral change, including history of traumatic brain injury, brain tumor, or neurological disorders (e.g., Parkinson's disease, dementia); lack of proficiency in English; and current psychosis, alcohol use disorder or substance use disorder as indicated on the PDSQ.

Potential participants who met online screening criteria were then interviewed to assess the inclusion criteria of at least 6 incidents of aggression on the MOAS (described below) in the past 3 months, a frequency we chose to ensure incidents were frequent enough to detect change with treatment. Our entrance criteria are distinct compared to many studies in this domain, which have included people on the basis of anger regardless of aggression levels.

Fig. 1 shows participant flow through the study. 215 participants (Mn age = 36.97, *SD* = 12.2) completed pre-treatment measures. Sample characteristics are reported in Table 1. All participants endorsed speaking English for at least 12 years, 82% were high school graduates, and 69% were college graduates. While we used number of instances on the MOAS for inclusion rather than weighted MOAS scores, our weighted MOAS scores were comparable to those observed in other treatment samples. For example, in inpatient samples characterized as high, intermediate, and low aggression, mean weighted MOAS total aggression scores were 6.53, 2.35, and 0.83, respectively (Kay et al., 1988). Comparable weighted MOAS aggression scores in the present study were 4.66 pre-treatment.

1.2. Design

Participants were randomly assigned to immediate treatment or wait list control using a random number generator, in a 1:1 allocation scheme. As shown in Fig. 1, all participants who were allocated initially to the wait list condition were subsequently offered the treatment. Participants who took part in the intervention after completion of the wait-list condition were asked to complete post-treatment and follow-up assessments in this randomized delayed-intervention controlled trial (RDICT; see, e.g., Rupp et al., 2019). This design allowed us to meet our ethical obligation to offer the active treatment to all people who sought our help for problems with impulsivity and aggression. In addition, the RDICT design allowed us to increase the statistical power and precision of this pilot study as all participants who took part in the treatment, either immediately or post-waitlist, were used to estimate the effect sizes associated with active treatment.

1.3. Timing of assessments

Participants completed screening measures. Those who met study entrance criteria completed demographic, medical, and treatment questions, and then were assigned to either immediate intervention or waitlist. Those in the immediate intervention condition completed pre-treatment assessments shortly thereafter and then began the intervention. They completed further assessments to provide personalized feedback and to provide information on potential moderators of treatment outcome during the second treatment session (discussed in the supplement). To allow time for practice of the final skills, *post-treatment* assessment was completed two weeks after the last treatment session. Participants also completed *follow-up* assessment 3 months after the final treatment session.

After the pre-waitlist assessment, participants initially allocated to the waitlist waited about 6 weeks. From this point onward, they followed the same sequence as those in the immediate intervention condition (post-waitlist/pre-treatment assessment, treatment, post-treatment assessment, follow-up assessment). Participants were paid $15 for completion of the pre-treatment assessment, $20 for the post-treatment assessment, $30 for the three-month follow-up assessments, and $15 for the pre-wait list assessment (for those in waitlist).

1.4. Measures

Self-rated impulsivity, and self- and interview-based ratings of aggression were conducted to screen for study inclusion and were repeated as outcome measures. Other measures were given to provide personalized feedback and were examined as potential predictors of attrition and outcome (see Supplement).

1.4.1. Modified Overt Aggression Scale (MOAS)

The original Overt Aggression Scale (Yudofsky et al., 1986) was modified to the Modified Overt Aggression Scale, which provides a rating system for frequency and severity of instances (MOAS; Kay et al., 1988). The MOAS is a clinician-administered, semi-structured interview designed to assess Verbal aggression (ranging from loudness and shouting to threatened violence), Aggression against property (ranging from less severe behaviors like slamming doors to more severe behaviors such as setting fires), Physical aggression (ranging from threatening gestures to serious physical harm), and Autoaggression (aggression toward self, including self-harm and suicide attempts). Items are rated on a scale of 1 (least severe) to 4 (most severe) and multiplied by type of aggression (verbal = 1, property = 2, autoaggression = 3, physical = 4) to yield total weighted scores ranging from 0 to 40 (Kay et al., 1988). Although the MOAS self-harm subscale contributes to total MOAS scores required for screening, all participants endorsed frequent aggression toward others on the MOAS. The first author, graduate students and research assistants completed interviews by phone. All interviewers completed review of gold standard interviews to establish reliability, and then conducted mock interviews for training purposes. Follow-up assessments were conducted by raters who were unaware of treatment status, except during a period with limited staff availability. Participants were reminded at the start of interviews not to disclose their treatment condition. We focused on past week severity, but also assessed three-month frequency of aggressive behavior at screening for inclusion. The MOAS has been validated in highly aggressive samples and has shown excellent interrater reliability across sites (Kay et al., 1988). Interrater reliability, intraclass correlation (ICC) using a two-way mixed model within SPSS on five mock cases, was excellent for all four scores, ICCs $\geq$ 0.994.

1.4.2. Buss-Perry Aggression Questionnaire (BPAQ)

The original AQ is the most widely used aggression scale and has been used in community, student and offender samples (Deffenbacher & Stark, 1992). We included all 9 Physical aggression items from the original AQ to ensure adequate coverage. We used the Anger and Verbal Aggression scales from the briefer 12-item BPAQ Short Form, a factor-analytically derived brief form of the BPAQ that shows higher internal consistency than the original scale (Bryant & Smith, 2001). Items ("Given enough provocation, I may hit another person," "I have threatened people I know") were rated on a scale of 1 (*Extremely*

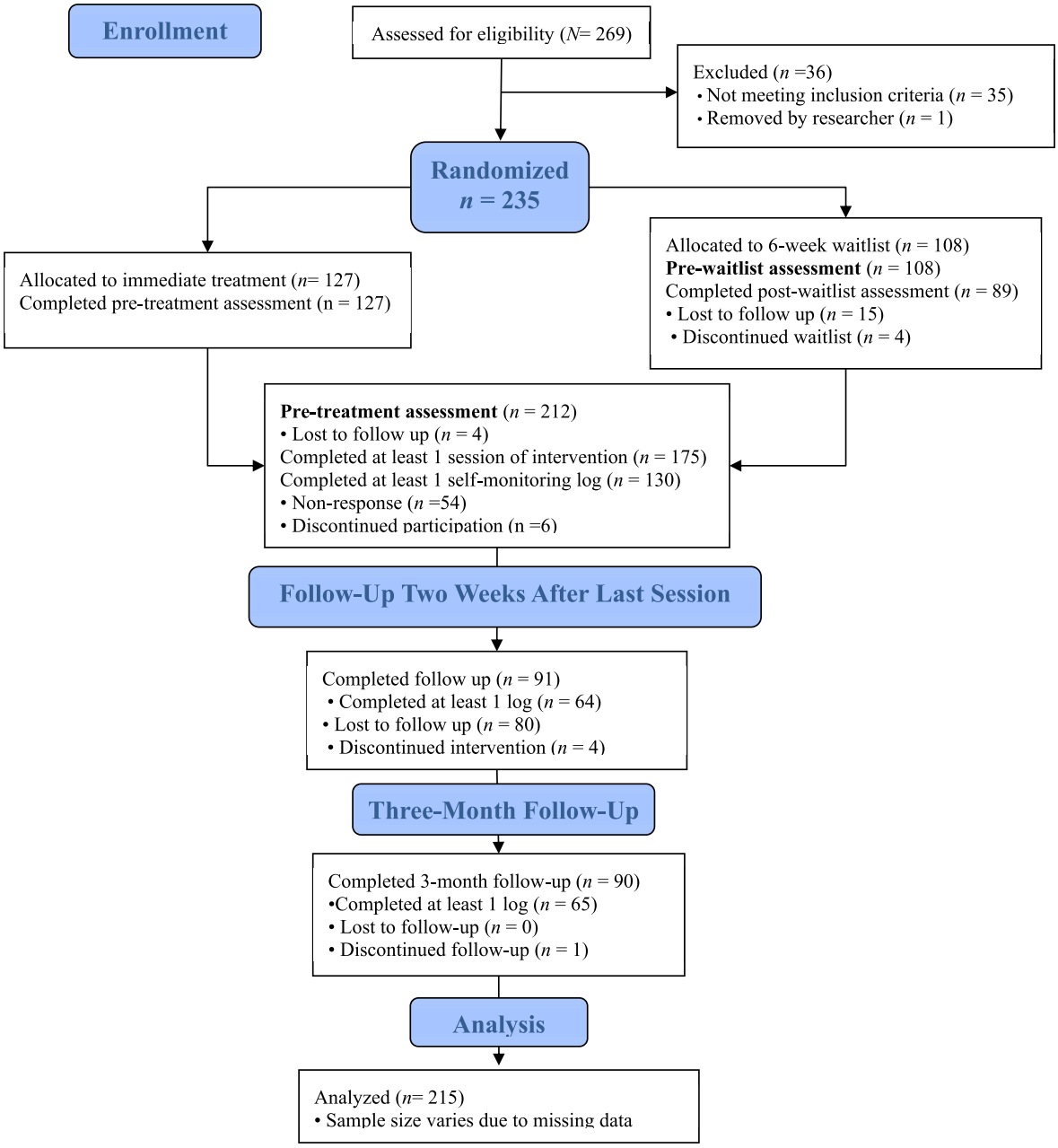

Fig. 1. Participant flow through immediate treatment and wait list conditions.

uncharacteristic of me) to 5 (*Extremely characteristic of me*) for the past month, consistent with previous use of the scale to document pre-post treatment changes (Kingston et al., 2014). Responses are summed to score each subscale. Internal reliability was acceptable for Physical aggression and Verbal aggression, but low for Anger, alphas = 0.86, 0.70, and 0.54, respectively. The BPAQ Hostility scale was not considered relevant to emotion-related impulsivity and was not examined.

1.4.3. Feelings Trigger Action Scale

The Feelings Trigger Action scale was designed to assess emotion-related impulsivity. It includes items from the Urgency and Positive Urgency measures, and items covering reflexive reactions to emotion states (Carver et al., 2011). Across undergraduate and clinical samples, the Feelings Trigger Action scale is significantly correlated with aggression, and effects withstand control for other forms of impulsivity, psychiatric syndromes, medications, and trauma history (Johnson et al., 2013; Johnson & Carver, 2016). The scale has been shown to be statistically separable from measures of non-emotion-related impulsivity, such as indices of inattention and lack of follow-through (Carver et al., 2011). In this sample, internal consistency was high, alpha = 0.91.

1.4.4. Daily peak anger

Participants reported the peak intensity of their anger experiences as part of each self-monitoring log (0 *no anger reported*; 1 *very little anger*; 10 *severe anger*). We computed a vector of daily peak anger scores by extracting the maximum reported anger intensity per day for each participant.

1.4.5. Treatment acceptability measures

After treatment, participants were asked several questions about the helpfulness of the program and specific intervention components (i.e. psychoeducation, implementation intentions, relaxation techniques, and logging).

Table 1
Descriptive statistics for demographic variables.

	N		%
Age	215	*M* = 36.97	*SD* = 12.2
Gender	197		
Female		150	76%
Male		47	24%
Race/Ethnicity	200		
Asian or Asian-American		21	10.50%
Black or African-American		37	18.50%
Hispanic or Latino		19	9.50%
White		116	58%
Other		7	3.50%
Legal Consequences Endorsed	175	21	12%
Lifetime Medication	199		
Bipolar Disorder		21	11%
Depression		90	45%
Emotional concerns		72	36%
Substance or alcohol abuse		4	2%
Other		21	11%
Therapy	201		
Lifetime		116	57.70%
Current		39	19.40%

1.4.6. Psychiatric Diagnostic Screening Questionnaire (PDSQ)

The PDSQ is a well-validated self-report scale designed to screen for psychiatric conditions (Zimmerman & Chelminski, 2006). The scale consists of true-false items. Across large samples, the scale has shown high sensitivity and specificity with semi-structured diagnostic interviews. We used the current Psychosis, Substance use disorder, and Alcohol use disorder (6 items each) scales to assess exclusion criteria (endorsement of 1 + Psychosis item, 2 + Substance or Alcohol items per scale). Psychosis items cover the past 2 weeks, and other items cover the past 6 months. Internal consistency was acceptable for the Psychosis subscale and excellent for the Substance and Alcohol use subscales, alphas = 0.77, 0.93 and = 0.90, respectively.

1.5. Intervention Components

The intervention consisted of 6 brief interactive sessions offered in sequence: (1) treatment overview and psychoeducation; (2) identifying risk factors, and early signs of anger and situations that often provoke aggression; (3) self-calming; (4) reviewing personalized feedback on self-monitoring responses; (5) implementation intention; (6) program review and implementation intention feedback. These modules were supplemented with daily self-monitoring. The manual can be obtained from the first author.

1.5.1. Psychoeducation

Psychoeducation focused on typical triggers of aggressive behavior (e.g., anger, disrespect), as well as cognitive, physiological, and behavioral warning signs of anger. To improve motivation, participants were asked to consider personal reasons for change, including interpersonal and legal consequences of their aggression.

1.5.2. Risk factors for aggression

Participants were asked to complete questionnaires about trauma history, cognitive styles, and emotional reactivity (see details in the Supplement) during the second intervention session. Participants received personalized feedback after each questionnaire.

1.5.3. Self-calming skills

We taught self-calming skills, such as relaxation and leaving the scene of a conflict until calmer. Among relaxation approaches, diaphragmatic breathing has been recommended for aggression prevention, as it can be used in complex social situations (Ferguson, 2006). Participants were taught skills for implementing relaxation (e.g., focus carefully on breathing to stop thinking about the sources of anger) and were asked to practice relaxation skills while imagining progressively more difficult interpersonal interactions.

1.5.4. Self-monitoring

Participants were asked to complete logs three times per day for two weeks after session 2. In each log, participants were asked whether they had felt angry since the last prompt. Those who endorsed anger were asked about the intensity of anger, physiological sensations, expression and duration of anger, triggers, persons involved, their coping responses (including relaxation exercises), and the effectiveness of those responses on a scale from 1 (*made worse*) to 10 (*felt much less angry*). After two weeks of logging, participants were given written personalized feedback about their patterns of anger and aggression and the effectiveness of various coping strategies. Participants were asked to complete identical logging procedures for two weeks before the post-treatment assessment and for two weeks before three-month follow-up.

1.5.5. Implementation intentions

In the fifth session, participants were taught to create an implementation intention plan to use a coping skill (e.g., relaxation or other personally preferred strategies) if they encountered high-risk situations for anger. They were informed that committing to a skill makes one more likely to use that skill when angry. Participants were guided through forming an implementation intention, including the Wish (e.g., stop yelling at my partner), Outcome (e.g., better relationship), Obstacle (e.g., responding too quickly to being angry), and Plan (e.g., leave the room for 10 min when I am angry). They were encouraged to practice and log results daily using the WOOP app (woopmylife.org/app; Saddawi-Konefka et al., 2017).

1.6. Development of the manual

To develop the intervention, we first reviewed existing treatment manuals (e.g. Kassinove and Tafrate, 2002). The first author drafted the manual, and co-authors reviewed the manual to provide feedback about coverage and clarity.

The first author pilot-tested the intervention in weekly individual face-to-face sessions with four clients to consider the helpfulness of the intervention. These four clients were recruited through online advertising and met the same criteria for high emotion-related impulsivity and high aggression (MOAS).

Although formal outcome data was not gathered on these pilot participants, they reported high satisfaction with the program. For example, one participant reported, “This was very helpful. The feedback was 100% true, and yet I had never put these patterns into words. Having the words will help me cope better in the future.” Another reported, “I have been more aware of when my anger is starting to emerge into negative actions and then stop myself by observing others' reactions more closely. Rather than yelling or saying something unkind, I pause and think about something else I can say or say nothing at all.” A third stated that emotion-related impulsivity captured more of her core issue than did previous diagnoses of bipolar disorder, PTSD, anxiety, and trauma. Based on client feedback, team members edited the manual to enhance language and to develop better graphs for the personalized feedback of the log data.

1.7. Intervention implementation

The intervention was offered individually online through Qualtrics (Qualtrics, Provo, Utah). Self-monitoring surveys were administered using LifeData software (LifeData LLC., Marion, Indiana). Participants scheduled sessions at their convenience but were encouraged to practice skills before turning to the next session. They were encouraged, but not required, to complete sessions weekly. To minimize attrition, we emailed participants a reminder if they did not log in for their next

session within one week and a second reminder one week thereafter if needed. Although we encouraged participants who dropped out to complete the post-treatment assessment, none did so.

1.8. Analyses

De-identified data is available at https://osf.io/zg95k/?view_only=40263a1eda3f4079a9a74c08609aa562.

1.8.1. Power analyses

Our initial aim was to enroll 170 participants. We estimated 25% attrition, and 130 participants would be adequate to detect medium effect sizes, $d = 0.50$.

1.8.2. Preliminary analyses

Before conducting main analyses, we graphed variables to check normality. Preliminary analyses assessed whether immediate treatment versus wait list groups were equivalent on aggression, impulsivity and demographic characteristics at baseline, and whether treatment completion or log completion was related to pre-treatment aggression and impulsivity. We also computed repeated measures correlations to assess statistical overlap among dependent variables, adjusting for the serial correlations within subjects (Bakdash & Marusich, 2017).

1.8.3. Tests of hypotheses

Our two primary aims were: 1) to ascertain whether treatment was associated with greater pre-post improvement in aggression and emotion-related impulsivity relative to the waitlist control and 2) to estimate the magnitude, durability, and reliability of improvement in those same metrics for all participants who took part in the treatment, including those who were initially allocated to the wait-list control.

To evaluate the efficacy of treatment relative to waitlist, we computed a 2 × 2 mixed ANOVA (FTA) and a pair of 2 × 2 mixed MANOVAs (BPAQ and MOAS). In each of these three models, the between-subjects factor was initial group allocation (immediate treatment vs. waitlist) and the within-subjects factor was time (T1 vs. T2). For participants in the immediate treatment group, T1 referred to the pre-treatment assessment and T2 referred to the post-treatment assessment. For participants in the wait-list group, T1 referred to the pre-waitlist assessment and T2 referred to the post-waitlist assessment. To be clear, these models did not incorporate post-treatment data for those who were initially allocated to the waitlist, nor any data from the 3-month follow-up timepoint. This design permitted a direct comparison of the slope of change over time associated with completion of treatment as compared to waitlist. The key index of treatment effect was the Group × Time interaction.

Next, to more precisely estimate the degree to which participation in the treatment was associated with significant and sustained improvement in aggression and emotion-related impulsivity, we conducted three parallel cluster-robust general linear models, one of which was univariate (Feelings Trigger Action) and two of which were multivariate (BPAQ and MOAS subscales, respectively). Time (pre-treatment, post-treatment, and three-month follow-up) was the sole regressor in each model. Cluster-robust general linear models account for non-independent observations within participants and require more minimal statistical assumptions than mixed effects models (Cameron & Miller, 2010). To ascertain whether treatment gains were sustained, we computed planned contrasts between post-treatment and follow-up. In addition, we computed the magnitude of change from pre-treatment to post-treatment per treatment completer for each of these treatment outcome measures to compute the proportion of participants who demonstrated reliable improvement (Jacobson & Truax, 1991). To maximize statistical power and precision, these analyses of treatment effects included those who were allocated to the waitlist initially but who subsequently received the treatment.

Beyond our key metrics of aggression and impulsivity, we considered how the daily peak intensity of anger, recorded in self-monitoring logs, changed over time (these logs were not gathered during the wait-list period). We first considered the degree to which the average intensity of these daily peaks declined at post-treatment and three-month follow-up compared to during treatment. Next, we examined change over time *within* the treatment as a preliminary indicator of gains during treatment. As above, time was entered as the sole regressor in each of these cluster-robust general linear models. In the former model, time was coded as 1 = Treatment, 2 = Post-Treatment, 3 = 3-Month Follow-Up. In the latter model, time was computed as the distance (in number of days) since each participant's first day of logging.

Overall, then, we included 3 primary analyses of treatment outcome indicators (FTA, MOAS, BPAQ) and 2 secondary analyses of treatment logs. To adjust the significance threshold to correct for family-wise error rates, we used a bonferonni correction, setting the threshold p value to .05/5, or 0.01. Descriptive statistics and ANOVAs were computed in SPSS version 25 (IBM, Chicago). Repeated measures correlations and cluster-robust general linear models were computed in R version 3.5.1 (R Foundation for Statistical Computing, Vienna, Austria). Repeated measures correlations were conducted with the rmcorr package (Bakdash & Marusich, 2017). Cluster-robust linear general linear models were conducted with the estimate package using bias-reduced linearization (CRVE = "CR2") with Satterthwaite degrees of freedom (Pustejovsky & Tipton, 2016). Post hoc contrasts were calculated with the multcomp package. Confidence intervals for effect sizes were calculated with apaTables for eta^2 and psychometric package for r^2. These effect sizes were converted to d for ease of comparison across studies (Cohen, 1988; Rosenthal, 1994).

2. Results

2.1. Program feasibility and acceptability

Participants who started the intervention ($n = 175$) completed an average of 4.31 online sessions (range = 1 to 6). Those who completed post-treatment assessment spent a median of 6.57 (Mn = 10.26, $SD = 7.25$, range = 1.86 to 33.14) weeks completing treatment. At post-treatment, participants rated the program as relevant ($M = 6.44$) and helpful ($M = 6.31$) on a 7-point scale ranging from not at all to a lot. On a 9-point scale ranging from not at all to a lot, participants were satisfied with the overall program ($M = 7.21$), rated the content of the program as useful long-term ($M = 7.14$), believed the program increased their general functioning and well-being ($M = 6.37$), and helped them meet their anger-related goals ($M = 6.47$). Due to experimenter programming error, only 46 participants were asked to rate satisfaction with specific sessions. Mean ratings per session differed significantly, $F(5,36) = 19.369$, $p < .0005$. Mean ratings of the implementation intentions session ($M = 4.33$ out of 9) were significantly below those for other sessions, which did not otherwise differ significantly. Participants found feedback about their anger ($M = 7.49$), psychoeducation about anger ($M = 7.29$), and learning about early warning signs of anger ($M = 7.26$) to be most helpful, followed by relaxation techniques ($M = 6.26$) and logging ($M = 5.64$).

2.2. Preliminary analyses

Due to experimenter error, 13 individuals received instructions to complete the BPAQ and FTA at pre-treatment without specifying to attend to the past month. These missing data were imputed using SPSS Missing Value imputation, regression option. Analyses with and without estimated data suggested comparable effect sizes. No significant difference was observed in mean MOAS scores conducted by raters who were aware or unaware of status, $p = .25$.

Immediate treatment and wait-list control groups did not differ significantly on pre-treatment aggression or impulsivity, $ps > 0.47$,

demographic variables, *ps* > 0.34, or history of psychotropic medication use, *ps* > 0.18. Treatment completers and noncompleters did not differ significantly on pre-treatment aggression or impulsivity, *ps* > 0.20 (see Supplement for more detail).

Participants (n = 130) who completed at least one self-monitoring log during treatment did not differ significantly from those who completed no logs on pre-treatment aggression or impulsivity, *ps* > .23, or demographic variables, *ps* > .10, with the exception that younger participants were more likely than older participants to complete at least one self-monitoring log, p = .02. Among those participants who completed at least one log during treatment, the proportion of logs completed was not significantly correlated with pre-treatment aggression or impulsivity, *ps* > .31, or demographic variables, *ps* > .11. On average, participants who completed at least one self-monitoring log completed 67% of logs during treatment (n = 130), 59% of logs at the post-treatment timepoint (n = 64), and 60% of logs at the 3-month follow-up timepoint (n = 65).

We computed repeated measures correlations to assess overlap among our key outcome measures (i.e., MOAS, BPAQ, and FTA) within timepoints. BPAQ subscales were highly correlated with one another and with Feelings Trigger Action, *rs* = .58-.73, *ps* < .001. MOAS Self-harm and Physical aggression scales were modestly correlated with other outcome indices, *rs* < 0.20, *ps* = .01-.90. Other dependent variables were moderately correlated, *rs* = 0.22-0.40, *ps* < .001. We also examined repeated measures correlations between these outcome measures and mean daily peak anger intensity. The intensity of daily anger peaks was moderately and significantly correlated with the BPAQ Anger subscale, r = 0.30, p = .02, and with the FTA, MOAS Verbal aggression, and two BPAQ Aggression scores, *rs* = 0.23-0.37, *ps* = .01–.0001, whereas correlations with the remaining MOAS subscale scores were more modest and statistically nonsignificant, *rs* = −0.06–0.16, *ps* = .08-.53.

2.3. Intervention outcomes

Table 2 shows descriptive statistics for treatment outcome variables at each time point. As described above, we first compared effects associated with completion of active treatment vs. completion of waitlist in a 2 × 2 mixed ANOVA (FTA) and a pair of 2 × 2 mixed MANOVAs (MOAS and BPAQ).

As shown in Table 3, these analyses of variance yielded evidence consistent with a treatment effect for all three of the key outcome metrics. That is, the Group × Time interaction was statistically significant for FTA, MOAS, and BPAQ. Examination of the simple slopes affirmed that completion of active treatment was associated with greater improvements in these measures than completion of the waitlist control. As a visual demonstration, Fig. 2 displays mean MOAS severity scores across time, separately for the immediate treatment and wait-list groups.

Table 3
Results of the mixed 2 (group) ×2 (time) analyses of variance.

	FTA *df* (1, 105)		MOAS *df* (4, 138)		BPAQ *df* (3, 101)	
	F	*p*	*F*	*p*	*F*	*p*
Group	5.24	.02	2.58	.03	5.86	.001
Time	45.48	< .001	9.86	< .001	19.52	< .001
Group × *Time*	10.30	.002	3.13	.02	6.18	.001

To more precisely estimate the magnitude and durability of treatment effects, we computed a series of five cluster-robust general linear models to estimate effects of time (1 = Pre-Treatment, 2 = Post-Treatment, 3 = 3-Month Follow-Up) on 1) FTA, 2) MOAS severity subscales, 3) BPAQ subscales, and 4) daily peak anger. For daily peak anger, we computed a fifth cluster-robust general linear model to examine change-over-time *within* the treatment timepoint by coding time as the number of days elapsed since each participants' first day of logging. As noted above, these analyses included all participants who were ultimately allocated to the active treatment, including those who had been initially allocated to the wait-list condition to maximize statistical power and precision. Including immediate treatment vs. delayed treatment as a control variable in these models did not substantively change effects, and so we present simpler models here without inclusion of treatment condition allocation.

Feelings Trigger Action impulsivity declined significantly over time (p < .001, adjusted r^2 = 0.15, 90% CI = [0.08, 0.24], Cohen's d = 0.84), and 55% of treatment completers demonstrated reliable improvement on the FTA. A contrast of the post-treatment and three-month follow-up timepoints was not significant (p = .71), suggesting that gains were preserved through follow-up.

There was a significant multivariate effect of time on the MOAS subscales (p < .001, eta^2 = 0.17, 90% CI = [0.11, 0.22], Cohen's d = 0.91), and 30% of treatment completers demonstrated reliable

Table 2
Descriptive statistics for treatment outcome variables for wait-list control and immediate treatment groups.

	Wait-list control		Wait-list control and immediate treatment							
	Pre-wait list		Pre-treatment		Pre-treatment		Post-treatment follow-up		3-month follow-up	
	N = 107		N = 89		*N* = 215		*N* = 91		*N* = 90	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Interviewer-Rated Aggression (MOAS)										
Verbal Aggression	1.82	0.81	1.69	0.79	1.71	0.75	1.27	0.9	1.18	0.87
Aggression against Property	1.50	1.13	1.24	1.10	1.36	1.15	0.6	0.93	0.48	0.84
Self-harm	0.26	0.68	0.34	0.88	0.41	0.92	0.33	0.81	0.17	0.62
Physical Aggression	0.41	0.89	0.31	0.70	0.38	0.81	0.19	0.58	0.06	0.31
Total*	7.26	5.41	6.43	5.42	7.18	5.69	4.22	4.71	2.86	3.37
3 Month Frequency*	66.8	73.2	52.0	52.6	51.4	50.5	38.1	53.9	23.9	33.9
1 Week Frequency*	5.77	7.06	4.84	5.28	4.66	5.10	2.63	4.00	1.46	2.47
Self-Rated Aggression (BPAQ)										
Anger	10.3	2.27	10.3	2.74	10.1	2.7	7.41	2.86	7.56	3.36
Verbal Aggression	9.95	2.06	9.66	3.31	9.81	2.74	7.61	2.97	7.4	3.49
Physical Aggression	25.6	6.62	22.3	7.84	22.7	7.45	18.2	6.64	18.1	7.27
Feelings Trigger Action	3.67	0.59	3.42	0.82	3.5	0.73	2.82	0.93	2.75	0.98

Note. Due to experimenter error, 10 participants completed initial BPAQ assessment anonymously and were considered missing in analyses. BPAQ = Buss-Perry Aggression Questionnaire, MOAS = Modified Overt Aggression Scale. *Included for descriptive purposes. Those in the wait list took pre- and post-wait list (i.e., pre-treatment) assessments, and then were allowed to progress through treatment, post-treatment follow-up, and 3-month follow-up.

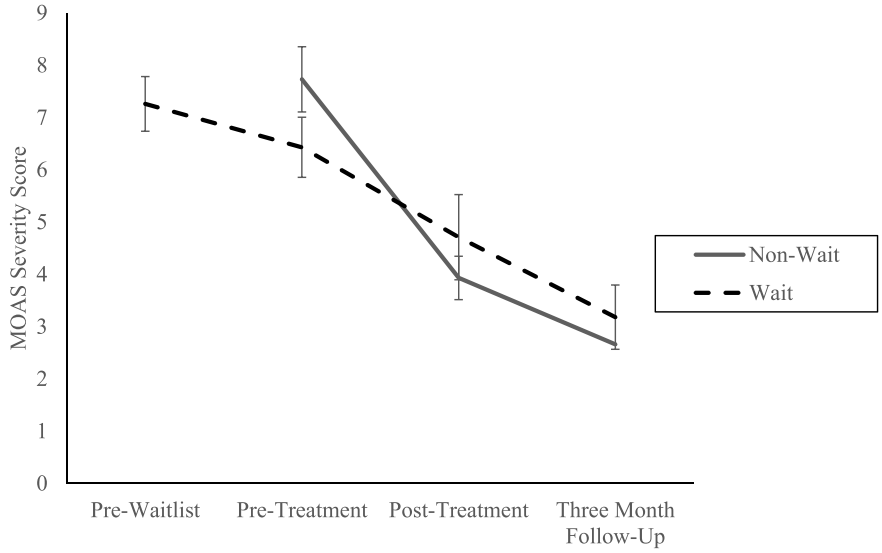

Fig. 2. Mean Modified Overt Aggression Scale (MOAS) Severity Scores at Pre-Waitlist, Pre-Treatment, Post-Treatment, and Three-Month Follow-Up for Participants Initially Allocated to Treatment versus Waitlist Note. Those who were initially assigned to the waitlist completed the treatment condition after they completed waitlist.

Note. Those who were initially assigned to the waitlist completed the treatment condition after they completed waitlist.

improvement on the MOAS from pre-to post-treatment. As shown in Table 4, univariate analyses revealed significant reductions over time in each of the four MOAS aggression severity subscales, although for self-harm severity this reduction was significant at three-month follow-up ($p < .001$), but not at post-treatment ($p = .40$). Planned contrasts indicated that post-treatment and three-month follow-up did not differ significantly, suggesting treatment effects were sustained ($ps > .06$).

There was a significant multivariate effect of time on the BPAQ subscales ($p < .001$, eta$^2 = 0.10$, 90% CI = [0.06, 0.13], Cohen's $d = 0.67$), and 47% of treatment completers demonstrated reliable improvement on the BPAQ. Univariate analyses indicated significant declines over time in each of the three BPAQ subscales ($ps < .001$). Contrasts revealed no significant change from post-treatment to three-month follow-up ($ps > .84$).

Daily peak anger decreased significantly across timepoints ($p < .001$, adjusted $r^2 = 0.04$, 90% CI = [0.00, 0.09], Cohen's $d = 0.41$), with effects that were sustained from post-treatment to three-month ($p = .50$). Daily peak anger also decreased across days within the treatment timepoint ($p < .001$, adjusted $r^2 = 0.08$, 90% CI = [0.01, 0.15], Cohen's $d = 0.59$), consistent with accumulation and practice of new skills.

3. Discussion

A large body of research indicates that violence and aggression relate to trait-like tendencies to respond impulsively to emotion. We aimed to provide the first clinical intervention designed to reduce aggression among persons who respond impulsively to heightened emotion. Because emotion-related impulsivity involves deficits in cognitive control that may interfere with the utility of standard cognitive therapy approaches, our intervention focuses on relaxation and behavioral strategies that have little cognitive control demand, and we used implementation intentions to foster use of these techniques in critical moments of anger. To enhance accessibility, we developed the program to be offered online.

Only 74% of those assigned to the intervention began treatment, and only 43% completed post-treatment follow-up, consistent with findings that fewer than half of individuals complete individualized face-to-face treatment for aggression (Ferguson, 2006). Our attrition rate exceeded the levels of 23%–41% in other remote interventions for aggression (Hargrave et al., 2008; Howie & Malouff, 2014). We were unable to identify significant predictors of attrition (see Supplement); however, the time-intensive nature of our self-monitoring logs and the absence of a coaching component may have contributed to attrition.

Notwithstanding the attrition level, participants who did complete the intervention rated the intervention as helpful, relevant, and likely to be useful in the future. They also reported perceiving improvements in their functioning, well-being, and anger-related goals. Although implementation intentions were rated as slightly less helpful, no component was rated as unhelpful. Nonetheless, people varied in their ratings of the components, so future research is warranted to disentangle which components are necessary, and how that might vary across individuals. It will be particularly important to assess the contributions of the self-monitoring component, given the labor-intensive nature of repeated logging.

Participants' perceptions of the helpfulness of the intervention were affirmed by analyses of our key outcome metrics. Direct comparisons indicated that those in the active treatment condition showed significantly greater improvements in aggression and emotion-related impulsivity as compared to any improvements observed during the waitlist control period.

In subsequent analyses to estimate the magnitude and durability of these effects which included all participants who took part in the intervention, including those who had been initially allocated to the waitlist control, we observed large treatment effects for self-rated emotion-related impulsivity and interviewer-rated aggression and moderate effects for self-ratings for physical, verbal, and property aggression. Participants who took part in the intervention also reported lower average peak anger intensity in their self-monitoring logs. All of these effects were maintained as of the 3-month follow-up assessment. That this intervention, which included simple strategies for identifying periods of emotion and implementing self-calming skills, could reduce rash responding to emotion is encouraging. This effect merits further attention, given that emotion-related impulsivity has been tied to such a broad range of psychopathologies and behavioral concerns (Berg et al., 2015) and has predicted poor outcome in cognitive therapy (Hershberger et al., 2017).

Consistent with the idea that the intervention promotes shifts in a broader range of impulsive responses, self-harm scores were significantly lower at 3-month follow-up compared to pre-treatment, even

Table 4
Parameter estimates for univariate cluster-robust general linear models of aggression and impulsivity during treatment (N = 215).

Dependent Variable	Time	*b*	*SE*	95% CI
Interviewer-Rated Aggression (MOAS)				
Verbal				
	Post-Treatment	−0.41**	0.10	-.60, −.22
	Three-Month Follow-Up	−0.51**	0.10	-.71, −.32
Property				
	Post-Treatment	−0.73**	0.11	-.95, −.51
	Three-Month Follow-Up	−0.86**	0.11	−1.08, −.65
Self-harm				
	Post-Treatment	−0.11	0.09	-.30, .07
	Three-Month Follow-Up	−0.25**	0.08	-.41, −.08
Physical				
	Post-Treatment	−0.18*	0.07	-.32, −.03
	Three-Month Follow-Up	−0.31**	0.06	-.43, −.20
Self-Rated Aggression (BPAQ)				
Verbal				
	Post-Treatment	−2.31**	0.36	−3.02, −1.59
	Three-Month Follow-Up	−2.45**	0.38	−3.20, −1.70
Anger				
	Post-Treatment	−2.68**	0.36	−3.40, −1.97
	Three-Month Follow-Up	−2.65**	0.38	−3.42, −1.89
Physical				
	Post-Treatment	−4.60**	0.77	−6.12, −3.08
	Three-Month Follow-Up	−4.60**	0.89	−6.36, −2.83
Feelings Trigger Action				
	Post-Treatment	−0.69**	0.11	-.90, −.48
	Three-Month Follow-Up	−0.75**	0.11	-.97, −.54
Daily Peak Anger (Across)	Within treatment	-.07**	.02	-.10, −.04
	Post-Treatment	-.53**	.22	-.97, −.09
	Three-Month Follow-Up	-.78**	.22	−1.21, −.35

Note. *p < .05, **p < .001; post-treatment = change from pre-treatment to post-treatment; three-month follow-up = change from pre-treatment to three-month follow-up. Analyses include those who received treatment immediately and those who received treatment after completing the wait-list control. BPAQ = Buss-Perry Aggression Questionnaire (missing for 30), MOAS = Modified Overt Aggression Scale. Three individuals failed to complete pre-treatment assessment but completed at least one follow-up assessment and were included in analyses. Peak anger scores were available for 130 during treatment, 64 post-treatment, and 65 at 3-month follow-up.

though the intervention was not designed to address self-directed aggression. Although these effects were not statistically significant at the post-treatment timepoint (when external aggression scales did show significant decline), this fits with findings that emotion-related impulsivity is tied to both self-harm and other-directed harm (Lockwood et al., 2017).

In summary, emotion-related impulsivity, anger, and multiple forms of aggression all declined significantly with participation in treatment. These gains are particularly intriguing given the severity of the sample—baseline rates of physical aggression were high, 93% reported trauma, most reported anxiety or depression symptoms, and 12% reported legal consequences of their anger. Analyses described in the supplement suggest that treatment effects mostly generalized across a broad array of demographic and clinical characteristics.

Despite the significant declines observed in aggression, self-harm, and impulsivity in the treatment condition, it is important to acknowledge limitations. Because those who left the program declined follow-up assessment, we were not able to conduct intent-to-treat analyses and satisfaction ratings do not include those who attrited. Self-rated anger scores showed low reliability (although showed parallel effects to peak anger ratings in daily logs). Our waitlist was designed to match time involved in acute treatment, so is not a good comparison condition for the 3-month follow-up. Longer time in the waitlist, however, was not significantly related to change in outcome measures. Although findings generalized across gender, our sample composition of 75% female does not reflect gender differences in aggression and is of concern given higher rates of physical aggression among men than women. We were unable to gather corroborative reports from close others regarding aggression, and our self-report and interview-based outcome measures may have been biased by participant desire to appear improved. It will also be important to consider longer-range outcomes.

In conclusion, a very low-cost intervention led to changes in key targets of aggression and emotion-related impulsivity. To our knowledge, this is the first intervention designed to address a clinical problem arising from emotion-related impulsivity. The online program could be easily disseminated. As such, if positive findings generalize across studies, this program could help address a major public health concern.

CRediT authorship contribution statement

Sheri L. Johnson: Conceptualization, Methodology, Writing - original draft, Supervision, Funding acquisition. **Mackenzie Rae Zisser:** Project administration, Formal analysis, Writing - review & editing. **Devon B. Sandel:** Project administration, Writing - review & editing. **Benjamin A. Swerdlow:** Formal analysis, Writing - review & editing. **Charles S. Carver:** Conceptualization, Writing - review & editing, Funding acquisition. **Amy H. Sanchez:** Methodology. **Ephrem Fernandez:** Conceptualization, Writing - review & editing, Funding acquisition.

Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.brat.2020.103708.

References

Bakdash, J. Z., & Marusich, L. R. (2017). Repeated measures correlation. *Frontiers in Psychology, 8*, 13. https://doi.org/10.3389/fpsyg.2017.00456.

Barnow, S, & Freyberger, HJ (2003). The Family Environment in Early Life and Aggressive Behavior in Adolescents and Young Adults. In MP Mattson (Ed.). *Neurobiology of Aggression. Contemporary Neuroscience* (pp. 213–229). Totowa, NJ: Humana Press. https://doi.org/10.1007/978-1-59259-382-8_12.

Berg, J. M., Latzman, R. D., Bliwise, N. G., & Lilienfeld, S. O. (2015). Parsing the heterogeneity of impulsivity: A meta-analytic review of the behavioral implications of the UPPS for psychopathology. *Psychological Assessment, 27*, 1129–1146. https://doi.org/10.1037/pas0000111.

Bousardt, A. M. C., Hoogendoorn, A. W., Noorthoorn, E. O., Hummelen, J. W., & Nijman, H. L. I. (2016). Predicting inpatient aggression by self-reported impulsivity in forensic

psychiatric patients. *Criminal Behaviour and Mental Health, 26*, 161–173. https://doi.org/10.1002/cbm.1955.
Bresin, K. (2019). Impulsivity and aggression: A meta-analysis using the UPPS model of impulsivity. *Aggression and Violent Behavior, 48*, 124–140. https://doi.org/10.1016/j.avb.2019.08.003.
Bryant, F. B., & Smith, B. D. (2001). Refining the architecture of aggression: A measurement model for the Buss–perry aggression questionnaire. *Journal of Research in Personality, 35*, 138–167. https://doi.org/10.1006/jrpe.2000.2302.
Cameron, A. C., & Miller, D. L. (2010). Robust inference with clustered data. In A. Ullah, & D. E. Giles (Eds.). *Handbook of empirical economics and finance* (pp. 1–28). Boca Raton, FL: CRC Press.
Carver, C. S., Johnson, S. L., Joormann, J., LeMoult, J., & Cuccaro, M. L. (2011). Childhood adversity interacts separately with 5-HTTLPR and BDNF to predict lifetime depression diagnosis. *Journal of Affective Disorders, 132*(1–2), 89–93. https://doi.org/10.1016/j.jad.2011.02.001.
Center for Disease Control and Prevention (CDC). (2014). *Injury prevention and control data and statistics (WISQARSTM)*. www.cdc.gov/injury/wisqars/index.html.
Coccaro, E. F., Lee, R. J., & Kavoussi, R. J. (2009). A double-blind, randomized, placebo-controlled trial of fluoxetine in patients with intermittent explosive disorder. *Journal of Clinical Psychiatry, 70*, 653–662. https://doi.org/10.4088/JCP.08m04150.
Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Erlbaum.
Cyders, M. A., & Coskunpinar, A. (2012). The relationship between self-report and lab task conceptualizations of impulsivity. *Journal of Research in Personality, 46*, 121–124. https://doi.org/10.1016/j.jrp.2011.11.005.
Cyders, M. A., Smith, G. T., Spillane, N. S., Fischer, S., Annus, A. M., & Peterson, C. (2007). Integration of impulsivity and positive mood to predict risky behavior: Development and validation of a measure of positive urgency. *Psychological Assessment, 19*, 107–118. https://doi.org/10.1037/1040-3590.19.1.107.
Deffenbacher, J. L., & Stark, R. S. (1992). Relaxation and cognitive-relaxation treatments of general anger. *Journal of Counseling Psychology, 39*, 158–167. https://doi.org/10.1037/0022-0167.39.2.158.
Del Vecchio, T., & O'Leary, K. D. (2004). Effectiveness of anger treatments for specific anger problems: A meta-analytic review. *Clinical Psychology Review, 24*, 15–34. https://doi.org/10.1016/j.cpr.2003.09.006.
Derefinko, K., DeWall, C. N., Metze, A. V., Walsh, E. C., & Lynam, D. R. (2011). Do different facets of impulsivity predict different types of aggression? *Aggressive Behavior, 37*, 223–233. https://doi.org/10.1002/ab.20387.
Dvorak, R. D., Pearson, M. R., & Kuvaas, N. J. (2013). The Five-Factor Model of impulsivity-like traits and emotional lability in aggressive behavior. *Aggressive Behavior, 39*, 222–228. https://doi.org/10.1002/ab.21474.
Ferguson, K. E. (2006). Intermittent explosive disorder. In J. E. Fisher, & W. T. O'Donohue (Eds.). *Practitioner's guide to evidence-based psychotherapy* (pp. 335–351). Springer Science + Business Media. https://doi.org/10.1007/978-0-387-28370-8_33.
Gallo, I. S., Keil, A., McCulloch, K. C., Rockstroh, B., & Gollwitzer, P. M. (2009). Strategic automation of emotion regulation. *Journal of Personality and Social Psychology, 96*, 11–31. https://doi.org/10.1037/a0013460.
Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology, 38*, 69–119. https://doi.org/10.1016/S0065-2601(06)38002-1.
Griffiths, K., Farrer, L., & Christensen, H. (2010). The efficacy of internet interventions for depression and anxiety disorders: A review of randomised controlled trials. *Medical Journal of Australia, 192*(11), S4–S11. https://doi.org/10.5694/j.1326-5377.2010.tb03685.
Hargrave, G. E., Hiatt, D., Alexander, R., & Shaffer, I. A. (2008). Help is on the line: Telephone-based counseling is just as effective as face-to-face service. *Behavioral Healthcare, 28*, 20–23.
Hershberger, A. R., Um, M., & Cyders, M. A. (2017). The relationship between the UPPS-P impulsive personality traits and substance use psychotherapy outcomes: A meta-analysis. *Drug and Alcohol Dependence, 178*, 408–416. https://doi.org/10.1016/j.drugalcdep.2017.05.032.
Hollin, C. R., & Bloxsom, C. A. J. (2007). Treatments for angry aggression. In T. A. Gannon, T. Ward, R. Beech, & D. Fisher (Eds.). *Wiley series in forensic clinical psychology. Aggressive offenders' cognition: Theory, research and practice* (pp. 215–229). New York, NY: John Wiley & Sons. https://doi.org/10.1002/9780470746295.ch11.
Hoptman, M. J., Antonius, D., Mauro, C. J., Parker, E. M., & Javitt, D. C. (2014). Cortical thinning, functional connectivity, and mood-related impulsivity in schizophrenia: Relationship to aggressive attitudes and behavior. *American Journal of Psychiatry, 171*, 939–948. https://doi.org/10.1176/appi.ajp.2014.13111553.
Howie, A. J., & Malouff, J. M. (2014). Effects of online cognitive treatment for problematic anger: A randomized controlled trial. *Cognitive Behaviour Therapy, 43*, 310–318. https://doi.org/10.1080/16506073.2014.939103.
Jacobson, N. S., & Truax, P. (1991). Clinical significance: A statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology, 59*, 12–19. https://doi.org/10.1037//0022-006x.59.1.12.
Johnson, Sheri L, Sandel, Devon B., Zisser, Mackenzie, Swerdlow, Benjamin A, Sanchez, Amy H., Fernandez, Ephrem, & Carver, Charles S (2020). A brief online intervention to address aggression in the context of emotion-related impulsivity for those treated for bipolar disorder: Feasibility, acceptability and pilot outcome data. *Journal of Behavioral and Cognitive Therapy, 30*(1), 65–74. https://doi.org/10.1016/j.jbct.2020.03.005.
Johnson, S. L., & Carver, C. S. (2016). Emotion-relevant impulsivity predicts sustained anger and aggression after remission in bipolar I disorder. *Journal of Affective Disorders, 189*, 169–175. https://doi.org/10.1016/j.jad.2015.07.050.
Johnson, S. L., Carver, C. S., & Joormann, J. (2013). Impulsive responses to emotion as a transdiagnostic vulnerability to internalizing and externalizing symptoms. *Journal of Affective Disorders, 150*(3), 872–878. https://doi.org/10.1016/j.jad.2013.05.004.
Johnson, S. L., Tharp, J. A., Peckham, A. D., Sanchez, A. H., & Carver, C. S. (2016). Positive urgency is related to difficulty inhibiting prepotent responses. *Emotion, 16*, 750–759. https://doi.org/10.1037/emo0000182.
Jones, R. M., Arlidge, J., Gillham, R., Reagu, S., van, D. B., & Taylor, P. J. (2011). Efficacy of mood stabilisers in the treatment of impulsive or repetitive aggression: Systematic review and meta-analysis. *British Journal of Psychiatry, 198*, 93–98. https://doi.org/10.1192/bjp.bp.110.083030.
Kassinove, H., & Tafrate, R. C. (2002). *Anger management: The complete treatment guidebook for practitioners.* Impact Publishers.
Kay, S. R., Wolkenfeld, F., & Murrill, L. (1988). Profiles of aggression among psychiatric patients. I. Nature and prevalence. *The Journal of Nervous and Mental Disease, 176*, 539–546.
Kessler, R. C., Coccaro, E. F., Fava, M., Jaeger, S., Jin, R., & Walters, E. (2006). The prevalence and correlates of DSM-IV intermittent explosive disorder in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 63*, 669–678. https://doi.org/10.1001/archpsyc.63.6.669.
Kingston, D. A., Yates, P. M., & Olver, M. E. (2014). The self-regulation model of sexual offending: Intermediate outcomes and posttreatment recidivism. *Sexual Abuse, 26*, 429–449. https://doi.org/10.1177/1079063213495896.
Lee, A. H., & DiGiuseppe, R. (2018). Anger and aggression treatments: A review of meta-analyses. *Current Opinion in Psychology, 19*, 65–74. https://doi.org/10.1016/j.copsyc.2017.04.004.
Lengfelder, A., & Gollwitzer, P. M. (2001). Reflective and reflexive action control in patients with frontal brain lesions. *Neuropsychology, 15*, 80–100. https://doi.org/10.1037/0894-4105.15.1.80.
Lindert, J., & Levav, I. (2015). *Violence and mental health: Its manifold faces.* Springer Science + Business Mediahttps://doi.org/10.1007/978-94-017-8999-8.
Lockwood, J., Daley, D., Townsend, E., & Sayal, K. (2017). Impulsivity and self-harm in adolescence: A systematic review. *European Child & Adolescent Psychiatry, 26*(4), 387–402. https://doi.org/10.1007/s00787-016-0915-5.
Lynam, D., & Miller, J. D. (2004). Personality pathways to impulsive behavior and their relations to deviance: Results from three samples. *Journal of Quantitative Criminology, 20*, 319–341. https://doi.org/10.1007/s10940-004-5867-0.
Mouilso, E. R., Calhoun, K. S., & Rosenbloom, T. G. (2016). Impulsivity and sexual assault in college men. In R. D. Maiuro (Ed.). *Perspectives on college sexual assault: Perpetrator, victim, and bystander* (pp. 137–150). Springer.
Novaco, R. W. (2013). Reducing anger-related offending: What works. In L. A. Craig, L. Dixon, & T. A. Gannon (Eds.). *What works in offender rehabilitation: An evidence-based approach to assessment and treatment* (pp. 211–236). Wiley-Blackwell. https://doi.org/10.1002/9781118320655.ch12.
Pearlstein, J. G., Johnson, S. L., Modavi, K., Peckham, A. D., & Carver, C. S. (2019). Neurocognitive mechanisms of emotion-related impulsivity: The role of arousal. *Psychophysiology, 56*, 1–9. https://doi.org/10.1111/psyp.13293.
Puhalla, A. A., Ammerman, B. A., Uyeji, L. L., Berman, M. E., & McCloskey, M. S. (2016). Negative urgency and reward/punishment sensitivity in intermittent explosive disorder. *Journal of Affective Disorders, 201*, 8–14. https://doi.org/10.1016/j.jad.2016.04.045.
Pustejovsky, J. E., & Tipton, E. (2016). *Small sample methods for cluster-robust variance estimation and hypothesis testing in fixed effects models.* ArXiv:1601.01981 [Stat].
Rosenthal, R. (1994). Parametric measures of effect size. In H. Cooper, & L. V. Hedges (Eds.). *The handbook of research synthesis* (pp. 231–244). Sage.
Rupp, C., Jürgens, C., Doebler, P., Andor, F., & Buhlmann, U. (2019). A randomized waitlist controlled trial comparing detached mindfulness and cognitive restructuring in obsessive compulsive disorder. *PLoS One, 14*(3), Article e0213895. https://doi.org/10.1371/journal.pone.0213895.
Saddawi-Konefka, D., Baker, K., Guarino, A., Burns, S. M., Oettingen, G., Gollwitzer, P. M., & Charnin, J. E. (2017). Changing resident physician studying behaviors: A randomized, comparative effectiveness trial of goal setting versus use of WOOP. *Journal of Graduate Medical Education, 9*, 451–457. https://doi.org/10.4300/JGME-D-16-00703.1.
Saini, M. (2009). A meta-analysis of the psychological treatment of anger: Developing guidelines for evidence-based practice. *Journal of the American Academy of Psychiatry and the Law, 37*, 473–488.
Schweiger Gallo, I., Bieleke, M., Alonso, M. A., Gollwitzer, P. M., & Oettingen, G. (2018). Downregulation of anger by mental contrasting with implementation intentions (MCII). *Frontiers in Psychology, 9*. https://doi.org/10.3389/fpsyg.2018.01838.
Scott, J. P., DiLillo, D., Maldonado, R. C., & Watkins, L. E. (2015). Negative urgency and emotion regulation strategy use: Associations with displaced aggression. *Aggressive Behavior, 41*, 502–512. https://doi.org/10.1002/ab.21588.
van Schalkwyk, Gerrit I, Beyer, Chad, Johnson, Jessica, Deal, Morgan, & Bloch, Michael H (2018). Antipsychotics for aggression in adults: A meta-analysis. *Progress in Neuro-Psychopharmacology and Biological Psychiatry, 81*, 452–458. https://doi.org/10.1016/j.pnpbp.2017.07.019.
Webb, T. L., Gallo, I. S., Miles, E., Gollwitzer, P. M., & Sheeran, P. (2012). Effective regulation of affect: An action control perspective on emotion regulation. *European Review of Social Psychology, 23*, 143–186. https://doi.org/10.1080/10463283.2012.718134.
Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin, 132*, 249–268. https://doi.org/10.1037/0033-2909.132.2.249.
Webb, T. L., Sheeran, P., Totterdell, P., Miles, E., Mansell, W., & Baker, S. (2012). Using implementation intentions to overcome the effect of mood on risky behaviour. *British Journal of Social Psychology, 51*, 330–345. https://doi.org/10.1348/014466610X533623.
Whiteside, S. P., & Lynam, D. R. (2001). The five factor model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual*

Differences, 30(4), 669–689. https://doi.org/10.1016/S0191-8869(00)00064-7.
Wilbertz, T., Deserno, L., Horstmann, A., Neumann, J., Villringer, A., Heinze, H., et al. (2014). Response inhibition and its relation to multidimensional impulsivity. *NeuroImage, 103*, 241–248. http://doi.org/10.13039/j.neuroimage.2014.09.021.
World Health Organization. (2014). *Report on violence prevention 2014*. https://who.int/violence.
Yudofsky, S. C., Silver, J. M., Jackson, W., Endicott, J., & Williams, D. (1986). The Overt Aggression Scale for the objective rating of verbal and physical aggression. *American Journal of Psychiatry, 143*(1), 35–39.
Zapolski, T., & Smith, G. T. (2017). Pilot Study: Implementing a brief DBT skills program in schools to reduce health risk behaviors among early adolescents. *The Journal of School Nursing, 33*(3), 198–204. https://doi.org/10.1177/1059840516673188.
Zimmerman, M., & Chelminski, I. (2006). A scale to screen for DSM-IV axis I disorders in psychiatric out-patients: Performance of the Psychiatric Diagnostic Screening Questionnaire. *Psychological Medicine, 36*, 1601–1611. https://doi.org/10.1017/S0033291706008257.