Supplementing evidence-based commercial weight management program with inhibitory control training: A pilot study

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PROTOCOL SUMMARY

Purpose and Knowledge to be Gained	This two-arm pilot study will be used to estimate the effect size in weight loss of supplementing the WW (formerly Weight Watchers) online program with gamified inhibitory control training (PolyRules!) among adults with overweight or obesity.
Research Procedures	• Participants (n=30) will be randomly assigned to one of two study arms: (1) WW (formerly weight watchers) only or (2) WW + Gamified inhibitory control training (PolyRules!). • All participants will complete demographic, medical history questionnaires and cognitive assessment battery at baseline/enrollment and after completing the 3-month intervention protocol. • All interactions with PolyRules! and WW will be passively recorded to monitor frequency of interaction with WW and PolyRules! • As compensation for completing all study procedures, participants will receive a $30 gift card.
Subject Population	• Adults (aged 18 and over)
Duration	• 12 months

GENERAL INFORMATION

CSMC Co-Investigators	Arash Asher, MD Jun Gong, MD
Biostatistics	Marcio Diniz, PhD
Sponsor/Funder	This study will be Internally funded Institutional Commitment to Dr. Salvy
Collaborating Institutions Involved in the Research	None

1.0 BACKGROUND, RATIONALE

Evidence-based weight management programs are effective when individuals adhere to treatment recommendations.[4] However, a majority of individuals are unable to engage and/or sustain a healthy diet[5-8] because of the interaction between powerful biological drives and omnipresent obesogenic environmental factors.[31]

A promising framework to address weight management challenges is premised on the reality that environmental cues can never be fully eliminated or prevented, so it may be valuable for

individuals to strengthen their self-regulatory control in order to inhibit their impulses when confronted with temptations. In this view, self-control is like a muscle, and although it fatigues, people can be trained to increase its strength.[1-3] This is consistent with Dr. Salvy's[4,5] and others' findings linking deficits in executive functioning and obesity,[6-15] and with the use of impulse control training to regulate food-related impulsivity.[16-19] Interventions based on the "Go/No-Go task," a paradigm for studying and training inhibitory control by challenging subjects to withhold impulsive responses, are particularly promising.[18] Go/No-Go training has been shown to increase short-term eating regulation and produce modest weight-loss.[18,19] However, previous studies include key limitations: limited dosage or training duration, exposure to a small set of stimuli and lack of tailoring to participants' proficiency. Furthermore, Go/No-Go impulse control programs primarily target single processes involved in inhibiting or suppressing motor responses rather than cognitive processes involved in inhibiting cue-response mappings. Resisting food cues not only requires inhibition of impulsive behaviors, but also inhibition of the reinforcing food task set.[20] The efficacy of these interventions in improving daily self-regulation is also controversial, with some broad claims based on thin, and often irrelevant, scientific evidence.[21-24]

To address the rigor of previous research, we draw upon recent developments in cognitive training with promising functional improvements in several areas (ADHD,[25] chemo brain,[26] age-related cognitive decline,[27] dyslexia,[28] schizophrenia,[29] sensory deficits,[30] brain injury,[31] in promoting mental fitness[27]). Novel inhibitory control training (PolyRules!) incorporates stimuli and task structures previously applied in visual perceptual learning and working memory training.[32,33] PolyRules! adjusts to the users' impulse control proficiency,[34-36] and gains have been found to generalize to other tasks[37-40] and transfer beyond the training context to complex activities.[33,41-43] Poly Rules! incorporates four guiding principles of gamification[44-47] to reinforce interactions with the app and promote adherence. Gamification, if applied properly, may promote positive behavioral health changes such as weight loss.

In a recent pilot study, we documented the acceptability and feasibility of PolyRules! training among middle-age adults (M age 59±9.4) who were receiving care at Cedars-Sinai Medical Center. We met our enrollment target (n=40) within three hours of emailing the study flyer. This enthusiastic response speaks to the need fulfilled by the proposed lifestyle and cognitive intervention components. Over 85% of respondents had attempted to lose weight in the last 5 years and 58% had tried to lose weight 5-10+ times. A majority of respondent (79%) said they knew what to eat but struggled keeping a healthy weight and adhering to healthy dietary recommendations. Over 90% of respondents reported that difficulty in resisting tempting foods and self-motivation were barriers to behavior change and weight loss. All components received mean scores >4 (1 = not at all useful, 5 = very useful) in terms of their usefulness in increasing adherence to dietary recommendations (**Figure 1**). All participants

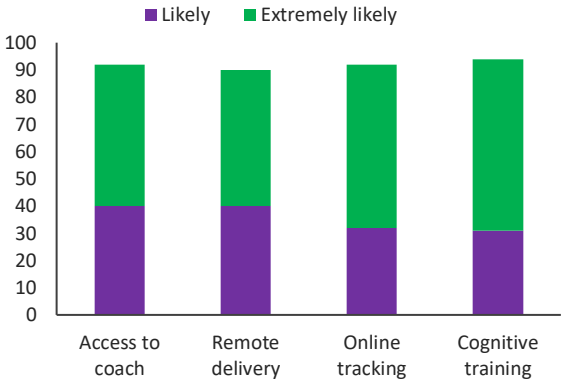

Fig 1. Proportion (%) of respondents (n=40) likely or extremely likely to participate if components were offered.

reported they would be likely or extremely likely to participate in an intervention combining inhibitory control training and weight management if it was offered.

A subset of ten participants further completed 10 days of PolyRules! training. All participants completed the daily 30-min training sessions and increased in proficiency over the 10-day training. **Figure 2** illustrates average improvement (••••) in inhibitory control, as well as participants with minimal (**ID09**) and steep (**ID03**) gains in performance over the 10 training sessions. Participants described the training as meditative, with the right balance of simplicity in navigating the app and cognitive challenge (e.g., *"I can feel my brain working"; "It's simple but challenging"; "Your brain is engaged*"). All participants enjoyed PolyRules! and asked if they could continue using the app. Most frequently cited immediate perceived benefits from using the app were in terms of improved focus, attention and memory *("I paid more attention than I normally would"; "I was able to recall the details about what I read, and this is not how I normally am")* and in terms of overall thinking and cognition *("The app is making me smarter!"; "I feel more alert"; "I'm sharper").*

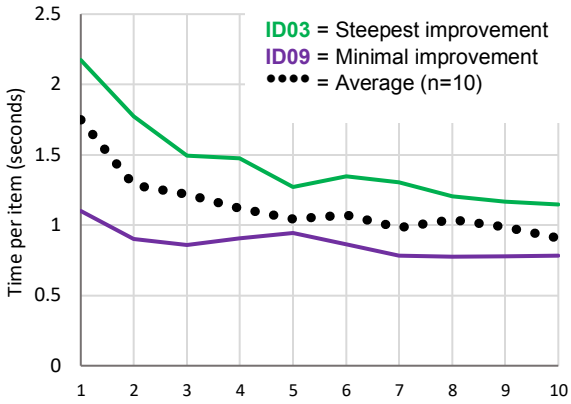

Fig 2. Improved inhibitory control over 10-day training.

This formative work supports the appeal and feasibility of gamified inhibitory control training as a stand-alone component. Additional data is needed to document inhibitory control training in combination to evidence-based weight management program. The proposed two-arm pilot study aims to estimate the effect size in weight loss of supplementing the WW (formerly Weight Watchers) online program with gamified inhibitory control training (PolyRules!) among adults with overweight or obesity. WW is a commercially available structured behavioral weight management program focusing on diet, physical activity and mindset skills. WW was selected for this study because it is the most used commercial program, and the #1 doctor recommended program based on a 2019 survey by Kantar Health of 500 doctors who recommend weight loss programs to patients.[48-52]

2.0 STUDY OBJECTIVES

2.1 Primary objective: To estimate the effect size in weight loss of supplementing the WW (formerly Weight Watchers) online program with gamified inhibitory control training (PolyRules!) among adults with overweight or obesity.

2.2 Secondary objectives: To explore whether inhibitory control training confers any benefits in terms of diet quality, physical activity or cognitive functioning in the early stages of a weight management program.

3.0 STUDY POPULATION

3.1 SELECTION OF THE STUDY POPULATION

Healthy adults (>18 years-old) will be recruited from Cedars-Sinai Medical Center and the general population.

3.2INCLUSION CRITERIA

Individuals will be eligible to participate if they meet any of the following criteria:

1) 18 years of age or older
2) Read, write, and speak English with acceptable visual acuity
3) BMI between 25-39.9 kg/m^2

3.3 EXCLUSION CRITERIA

Individuals will not be eligible to participate if they meet any of the following criteria:

1) Currently enrolled in weight loss interventions or undergoing bariatric surgery
2) Pregnant women
3) Individuals with severe cognitive delays or visual/hearing impairment

3.4 SUBJECT SCREENING AND ENROLLMENT

- Study advertisements (flyers, online posting) will instruct interested individuals to contact the study research coordinators via email, phone or text message for more information.
- Individuals who contact the study team will be screened over the phone or provided a REDCap link containing the screening questions. After the screening questions are completed, the study team will review the information and follow up with individuals over the phone, email or via text to inform them if they are eligible for the study and explain the consenting process.
- Electronic consent (eIC) will be obtained using DocuSign. The study coordinator will email the electronic consent to potential participants and then schedule a time to review it over the phone, MS Teams or other video-conferencing software. During this time individuals will have the opportunity to ask questions and discontinue if they are no longer interested in the study. If they want to enroll in the study, the coordinator will email the consent (via DocuSign portal) with the signature fields highlighted to indicate a signature is required. Signature capture can be performed by a stylus and signature pad, mouse, signing with a finger on a touch screen, or by typing a name in an e-signature. When the document is signed electronically DocuSign can send a PDF of the eIC to the study team, which will be reviewed by the

coordinator. Once the eIC is complete, a copy will be emailed to the participants, and it will be stored in a Box folder.

3.5 SUBJECT RECRUITMENT

- Participants will be recruited from Cedars-Sinai and through community outreach with flyers posted around the community and distributed at community events. The study will also be posted online on Craigslist and on Cedars' internal online newsletter, the Bridge. Interested individuals will be instructed to contact the study team via email, phone, or text message for more information.

4.0 STUDY DESIGN AND METHODS

4.1 OVERVIEW OF STUDY DESIGN AND PROCEDURES

Participants (n=30) will be randomly assigned to one of two arms: (1) WW (formerly weight watchers) only or (2) WW + Gamified inhibitory control training (PolyRules!). All participants will complete demographic, medical history questionnaires and cognitive assessment battery at baseline/enrollment and after completing the 3-month intervention protocol. As compensation for completing all study procedures, participants will receive a $30 gift card.

4.2 STUDY ARMS

WW (all participants; n = 30): All participants will receive pre-loaded computer tablets and 3-month access to the WW digital program. WW is a structured behavioral weight management program that focuses on diet, physical activity and mindset skills. The dietary approach is based on creating an energy deficit diet to produce weight loss while also being attentive to the quality of the calories. Specifically, the WW program assigns SmartPoints values to foods based on calories, sugar, saturated fat and protein. In addition, particular foods are assigned a points value of zero (0) to encourage a healthier eating pattern (e.g. fruits, vegetables, non-fat yogurt, fish). Upon sign-up, an individualized SmartPoints budget consisting of a daily SmartPoints target and weekly SmartPoints allowance is calculated based on height, weight, age and sex. The fitness component assigns FitPoints values to physical activities based on the type, duration, intensity and the participant's body weight. Participants receive 24/7 access to coaches, automatic enrollment in a rewards program based on behaviors, weekly emails motivating lifestyle changes and a closed social network for WW members.

WW + PolyRules! (50% of participants, n = 15): Participants assigned to the WW+ Polyrules arm will receive access to the WW online program (as described above) and to the PolyRules! app for three months. Participants will be trained on how to use PolyRules! via Zoom or Team Meeting platforms. Participants will be asked to engage in daily

cognitive training using the PolyRules! app for three months. They will be instructed to start with 20-min of daily cognitive training and to progressively increase their training time to 30-min. All interactions with PolyRules! will be passively recorded to monitor whether participants engage in cognitive training.

4.3 MEASUREMENTS

Demographics

Participants will complete a questionnaire surveying: date of birth, sex, ethnicity, socioeconomic status (SES: education level, household income, marital status, employment status), household composition (multigenerational, single, married, cohabitating, children) and medical history.

Shared weight, dietary and physical activity data

As part of the WW experience, participants are instructed to track their weight, daily food intake and physical activity via the WW mobile app or online website. As a secondary objective, we will explore weight loss, dietary intake and physical activity over the course of the study and across study arms.

Cognitive Functioning

As a secondary objective, we will explore changes in attention, inhibitory control and working memory over the course of the study across study arms.

Executive Functioning

The Behavior Rating Inventory of Executive Function®- Adult Version (BRIEF-A) is a standardized measure of executive functions or self-regulation in everyday environment. The BRIEF-A assesses nine nonoverlapping theoretically and empirically derived clinical scales: Inhibit, Self-Monitor, Plan/Organize, Shift, Initiate, Task Monitor, Emotional Control, Working Memory, and Organization of Materials. BRIEF-A is available in English and Spanish and can be computer-administered.

Attention and Inhibitory Control Tasks

The *Cancellation Task* is a timed, tablet-based test of selective attention and inhibitory control, akin to D2 (Brickenkamp & Zilmer, 1998). There are two versions that can be used interchangeably: Cancellation Letters and Cancellation Pictures. Cancellation - Letters resembles the D2 in that it consists of similar stimuli: characters “d” and “p” with one to four dashes, arranged either individually or in pairs above or below the letters. For Letters, the participant must scan the items from left to right and select all “d”s with two dashes

(targets). In Cancellation - Pictures, letters are replaced with pictures of dogs and monkeys, some of which are rotated along the vertical axis or are presented upside down. For Pictures, the participant must select the upright dog (tail on the left) and the upside-down monkey (tail on right) separately in single blocks and together in a mixed block.

The *Countermanding* task is a relatively fast and easy task that is appropriate for all age levels, including children. The participant is instructed to tap on one of two green buttons in response to a visual stimulus - a picture of a dog or a monkey. For dogs, the participant must tap on the button that is on the same side of the screen (congruent trial); however, when the participant sees a monkey, they must tap on the button that is on the opposite side (incongruent trial). Note that the visual stimuli appear on the left or on the right interchangeably. On incongruent trials, the participant must inhibit a prepotent response to respond on the same side as the visual stimulus. There are 3 blocks of trials, each preceded by a practice session. The stimuli are presented on the screen until the participant responds, with an upper time limit of 15 seconds. Accuracy is typically very high in this task thus the main dependent measure is reaction time for correct responses on congruent and incongruent trials.

Working Memory Tasks

In the *N-Back* task, participants are presented with a consecutive stream of pictures, and the objective is to tap on the pictures that match those presented *N* items earlier. Higher levels of *N* levels increase WM load and make the task more difficult. All participants complete 1-back (Figure 4), 2-back, and 3-back (in that order). Before each level starts, there is a practice session consisting of 10 trials during which performance feedback is provided. The test phase for each N-level consists of 30 trials with 9 targets. Progression to 4-back (and beyond) is allowed if the participant made no more than 2 errors on the previous level. Stimuli are presented for 2500 ms (participant can respond during this period) with an ISI of 500 ms.

In the *Letter-Number task*, participants are presented with a mixed order of letters and numbers, which they must remember and sort them numerically and alphabetically. For example, the sequence ‘H8T3K5’ would be sorted into ‘358’ and ‘HKT’. The mixed orders of letter and numbers ranges from 2 to 15. After a short tutorial, the participant practices the task and must get three out of the five trials correct to proceed to the test. The Letter Number Task is split into two parts: The first is a method of limits to find the participants threshold, whereas the second provides additional trials around that threshold. Characters that could be confused with other letters or numbers are excluded (0, I, O, U, X). Moreover, a given sequence does not include any of the characters in the previous trial and it does not contain consecutive numbers and letters**.**

Visuo-spatial working memory will be measured with a modified Corsi Tasks, a collection of 4 types of tasks (i.e. classic - blocks, simple, complex, sequencing) that are customizable

where an experimenter can select which task mode, stimulus type, and algorithm they want to use. In all versions of the task, the participant is shown instructions and then practices the task. *Corsi Blocks Classic*: The participant first completes *Corsi Blocks Forward* (tap in same order), followed by *Corsi Blocks Reverse* (tap in reverse order). The Corsi Blocks Forward task is split into two parts: the first is a method of limits to find the participants threshold, whereas the second provides additional trials around that threshold. *Complex Corsi*: Combines Simple Corsi with a secondary sorting task in between each trial. In the sorting task, the participant must drag a dog to a bone or a monkey to a banana. The location of the bone and banana are randomized to prevent mnemonic strategies like chunking.

Exit Interview

Table 1 outlines questions asked during the exit interview across study arms.

Table 1. Interview questions across study arms.

	WW only	WW + PolyRules!
1. What prompted you to participate in the study?	x	x
2. What are the top 3 things that you liked about WW?	x	x
3. Describe any concerns you had regarding WW?	x	x
4. Can you tell me about some changes (good or bad) you have experiences since you have started WW?	x	x
5. Would you continue using WW if available?	x	x
6. What are the top 3 things that you liked about PolyRules!?		x
7. Describe any concerns you had regarding PolyRules!?		x
8. Do you feel cognitive training helped you with your weight loss?		x
9. Can you tell me about some changes (good or bad) you have experienced since you have started using PolyRules!?		x
10. Would you continue using PolyRules! if available		x
11. Would you be interested in participating in a larger study testing the benefits of combining cognitive training and WW	x	x
12. Is there anything else you would like to share about the study	x	x

Schedule of Procedures

Procedures	Enrollment	Intervention	Post-Intervention
Informed Consent (DocuSign)	X		
Baseline assessment	X		
Randomization	X		
Equipment/software/application set-up and training		X	
Intervention: - WW only group - WW + PolyRules! group		X	
Post-intervention assessment			X
Exit interview			X
Equipment Return			X
Compensation			X

5.0DATA COLLECTION and MANAGEMENT

5.1 DATA PROCUREMENT

This study utilizes primary data collection. Data will be collected from participants enrolled in the study.

5.2 TIME PERIOD OF DATA UNDER REVIEW

Questionnaire data will be collected at baseline / enrollment and after the 3-month intervention protocol. Frequency of PolyRules! use and interactions with the WW program will be passively recorded on the PolyRules! and WW platforms. Participant data will be included in the analysis if at least three valid days of interactions with the WW program and PolyRules! use (if applicable) are available. De-identified data will be kept for 5 years and then destroyed.

5.3 VARIABLES COLLECTED

- Demographics: date of birth, sex, ethnicity, socioeconomic status (SES: education level, household income, marital status, employment status), household composition (multigenerational, single, married, cohabitating, children) and medical history

- **Weight, dietary and physical activity data.** Participants' reported/tracked weight, food intake and physical activity data via the WW mobile app or online website.
- Executive functioning as measured by the Behavior Rating Inventory of Executive Function®- Adult Version (BRIEF-A)
- Cognitive functioning: inhibitory control, attention, verbal working memory tasks, visuo-spatial working memory tasks, and working memory capacity tasks

5.4 SOURCE DOCUMENTS

- All data will be stored electronically in secure servers at Cedars-Sinai, with the exception of (1) WW shared weight, dietary and physical activity stored on the HIPPA -compliant WW platform and PolyRules! app usage data which will be stored on a HIPPA-compliant Amazon Web Services Server that is under the University of California business use agreement with Amazon.
- The surveys/questionnaires administered will be electronically based in REDCap, which is a survey platform on a Cedars-approved, secure network. The participant will be identifiable by a participant number which is linked to the participant in a separate, electronically secured location.
- The code list linking participant responses to their identity will be kept in a separate, electronically secured location. After analysis is complete, this list will be destroyed.
- Participants will be informed that audio recordings of semi-structured interviews will be kept until the completion of the study. Audio recordings will be transcribed and analyzed as soon as possible by the study team. After transcription has been completed, the audio recordings will be destroyed.
- Deidentified study data will be kept for 5 years after the study is completed. At the conclusion of the study, all study data will be destroyed.

5.5 DATA COLLECTION AND STORAGE

- Participants' consent forms will be stored in a password protected folder in Box, which is located in secure servers at Cedars-Sinai.
- A unique participant number will be used for all the data so that it can be traced back to the consent form should the participant wish to withdraw.
- Information on participants' demographics data will be stored in REDCap separate from the participant's identifying information.
- Audio data (from semi-structured interviews) will be securely stored in a Box folder. Access to audio data will be strictly monitored and limited to study staff. All audio data will be transcribed and analyzed at the earliest opportunity. After transcription, the audio files will be destroyed.

5.6 CONFIDENTIALITY AND SECURITY OF DATA

- All data will be stored electronically in secure servers.
- A unique participant number will be used for all the data so that it can be traced back to the consent form should the participant wish to withdraw. The unique participant number will be kept in a REDCap database which will be separate from the data and consent documents.
- Information on participants' demographics data will be stored in REDCap separate from the participant's identifying information.
- Only IRB approved study staff and the PI will have access to the data collected. Personal and sensitive data will be stored for 5 years and will be destroyed after this time by the PI.

6.0 DATA AND SAFETY MONITORING

6.1 DATA AND SAFETY MONITORING PLAN

- All data will be stored electronically in secure servers (REDCap, Amazon Web Services)
- The Box folder containing the consent forms will be password protected.
- The audio recordings stored in a Box folder will also be password protected.
- The PI will be responsible for data and safety monitoring for this study.
- Any deviations from the research protocol or unexpected problems will be reported promptly to the Cedars-Sinai IRB.

6.2 QUALITY CONTROL AND QUALITY ASSURANCE

Principles underlying our approach to quality control include:

- Standardization of measurements
- Use of clear and specific protocols for all study activities including training for data collection and processing
- Validation and verification of data management procedures by using software capable of checking for out-of-range values and other sources of outliers
- Implementation of a data cleaning protocol
- Confidentiality will be strictly maintained during all data management
- The research team will follow aforementioned schemes to collect and manage study data by maintaining consistent quality and security of the study observations.

7.0 STATISTICAL CONSIDERATIONS

7.1 STUDY OUTCOME MEASURES

The primary objective of this study is to estimate the effect size in weight loss of supplementing the WW online program with gamified inhibitory control training (PolyRules!) among adults with overweight or obesity.

As a secondary objective, we will explore changes in dietary intake, physical activity, attention, inhibitory control and working memory over the course of study across study arms.

Primary endpoints

- Weight loss from baseline to 3 months.

Secondary endpoints

- As a secondary objective, we will explore dietary intake, physical activity, attention, inhibitory control and working memory over the course of the study and across study arms. We acknowledge that we are not powered to detect between-group difference on these outcomes. However, inasmuch as participants assigned to the WW only group do not engage in inhibitory control training, we expect no change in attention, inhibitory control and working memory over the course of the study among participants randomized to WW only.

- Qualitative outcomes measures will include participant's satisfaction with WW and PolyRules! (if applicable) and perceived benefits. Perceived satisfaction/dissatisfaction and preferred features of the WW and PolyRules! app will be qualitatively assessed and data obtained in semi-structured interviews will be summarized.

7.2 SAMPLE CONSIDERATIONS

- Sample size was defined based on available funding such that we expect drop-out over 3 months given the study is longitudinal. Therefore, a sample size of 30 will provide us a reasonable sample size to estimate the effect size.

7.3 STATISTICAL ANALYSES

Descriptive analysis will be presented with mean ± standard deviation for quantitative variables, and frequency (percentages) for qualitative variables. A 95% confidence interval for the difference in weight loss between WW and WW + PolyRules! will be calculated. Cognitive test scores (inhibitory control, attention, verbal working memory tasks, visuo-spatial working memory tasks, and working memory capacity tasks), executive function, and physical activity questionnaires will be scored and summarized (Mean and SD) by group and used to inform the design of a larger randomized controlled trial. Calculations will be performed using R-package, version 4.0.[53]

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CEDARS-SINAI MEDICAL CENTER

CONSENT FORM FOR RESEARCH

Title: SUPPLEMENTING EVIDENCE-BASED COMMERCIAL WEIGHT MANAGEMENT PROGRAM WITH INHIBITORY CONTROL TRAINING: A PILOT STUDY

STUDY SUPPORT PROVIDED BY: CEDARS-SINAI MEDICAL CENTER

PRINCIPAL INVESTIGATOR: SARAH-JEANNE SALVY, PHD

CSMC CO-INVESTIGATORS: ARASH ASHER, MD, PHD, JUN GONG, MD, AND MARCIO DINIZ, PHD

STUDY CONTACT PHONE NUMBER AT CSMC: 310-423-2062 (24 HOURS)

We are seeking your consent to take part in this research study. Your participation in this research is voluntary. If you choose to participate, you can stop at any time. Please consider the following summary, along with the more detailed information provided throughout this consent form.

1. WHAT IS THE PURPOSE OF THIS RESEARCH STUDY?

The purpose of this pilot study is to explore the benefits of supplementing the WW (formerly Weight Watchers) online program with a cognitive training game (PolyRules!) among adults with overweight or obesity.

You are being asked to take part in this research study because you showed interest in the study and are 18 years old or older.

The study will enroll up to 30 people total.

2. WHAT WILL HAPPEN DURING THE STUDY?

This section provides a general overview of what will happen during your participation in the study. Information included below should be considered before deciding to participate. **Research-related procedures** are those performed solely for the research. They would not be performed if you did not take part in the study.

Overview of study:

- If you agree to participate in the study, you will be randomly assigned (like flipping a coin) to one of two groups:

  Group 1: WW (formerly Weight Watchers) only

  Group 2: WW + Cognitive training game (PolyRules!)

- You will be asked to complete demographic, and medical history questionnaires and a computer-administered cognitive test at baseline/enrollment and after completing the three-month intervention protocol (described below).

- After the three-month intervention, you will be asked to participate in a one-on-one interview (conducted remotely) to share your experience in the study.

- As compensation for completing all study procedures, you will receive a $30 gift card.

Description of Study Arms:

If you agree to participate you will be randomly placed into one of the two groups. The study team has no control over which intervention you receive.

Group 1: WW ((50% of participants, n = 15): Participants assigned to the WW arm will receive pre-loaded computer tablets and 3-month access to the WW digital program. The computer tablets will need to be returned to study staff after the intervention is completed. Participants will be provided a prepaid return box to mail the computer tablets to study staff. WW is a structured behavioral weight management program that focuses on diet, physical activity and mindset skills. The dietary approach is based on creating an energy deficit diet to produce weight loss while also being attentive to the quality of the calories. Specifically, the WW program assigns SmartPoints values to foods based on calories, sugar, saturated fat and protein. In addition, particular foods are assigned a points value of zero (0) to encourage a healthier eating pattern (e.g. fruits, vegetables, non-fat yogurt, fish). Upon sign-up, an individualized SmartPoints budget consisting of a daily SmartPoints target and weekly SmartPoints allowance is calculated based on height, weight, age and sex. The fitness component assigns FitPoints values to physical activities based on the type, duration, intensity and the participant's body weight. Participants receive 24/7 access to coaches, automatic enrollment in a rewards program based on behaviors, weekly emails motivating lifestyle changes and a closed social network, in which WW members can interact with other members (if they choose to) via the WW app.

Group 2: WW + PolyRules! (50% of participants, n = 15): Participants assigned to the WW+ Polyrules! arm will receive access to the WW online program (as described above) and to the PolyRules! app for three months. Participants will be trained on how to use PolyRules! via Zoom or Team Meeting platforms. Participants will be asked to engage in daily cognitive training using the PolyRules! app for three months. They will be instructed to start with 20-min of daily cognitive training and to progressively increase their training time to 30-min. All interactions with PolyRules! will be passively recorded to monitor whether participants engage in cognitive training.

Semi-Structured Interview: After you complete the three-week intervention, you will be asked to take part in a one-on-one interview (conducted remotely over Zoom or Team Meeting) to obtain your feedback regarding your experience with the study. This interview will be audio recorded for accuracy and transcription purposes. Audio recordings will be confidential, and we will do our best to make sure that your identity is kept private, but we cannot guarantee total privacy. The audio files will be accessed only by verified members of the study team and will be kept until they have been analyzed. After analysis and completion of the study, all audio recordings will be destroyed.

How long will you be in the study?
You will be in the study for approximately 12 months. This will involve 2 e-visits (baseline/enrollment, at completion of the intervention) 3 months apart and several interactions with the research staff throughout the study duration. Additionally, you will be asked to participate in a semi-structured interview to share your experience in the study.

Schedule of Procedures

Procedures	Enrollment	Intervention	Post-Intervention
Informed Consent (DocuSign)	X		
Baseline assessment	X		
Randomization	X		
Equipment/software/application set-up and training		X	
Intervention: - WW only group - WW + PolyRules! group		X	
Post-intervention assessment			X
Exit interview			X
Equipment Return via Prepaid Box			X
Compensation			X

3. WHAT ARE THE POSSIBLE RISKS?

This section describes the possible risks and/or discomforts we anticipate you could experience that are related to the study procedures.

Although risks and discomfort are unlikely in this study, you may feel uncomfortable answering some of the questions. You do not have to answer any questions if you are not comfortable and can withdraw from the study at any time.

This research involves the potential risk of accidental release of confidential information. We will do our best to make sure that the personal information collected as part of this study is kept private. However, we cannot guarantee total privacy. Data will be stored in password-protected files accessible only to the investigators and staff under their supervision. In the database, only an ID code number will identify subjects. If information from this study is published or presented at scientific meetings, your name and other identifiable personal information will not be used.

Other risks include disclosure of your IP address when connecting the study provided ~~your~~ iPad to the internet. An IP address is a unique identifying number used to identify computers/devices connected to the Internet. An IP address might be static (i.e., always refer to one institution's server), dynamic (assigned upon connection), or pooled (a group of servers share one or more IP

addresses). IP addresses represent a form of potentially indirect identifying information such as city geolocation. An IP address is less of a threat to confidentiality than handwriting, fingerprints, postal-addresses, email addresses, handwritten signatures, or being observed completing a paper survey. We will not collect or use your IP address for any research purposes.

4. ARE THERE BENEFITS IN TAKING PART IN THE STUDY?

If you agree to take part in this research study, there may or may not be direct medical benefit to you. The possible benefits of taking part in the research study are improvements in cognitive functioning and/or physical activity. You may also enjoy the gamified cognitive training and physical activity regimen. However, no benefit is guaranteed.

5. WHY WOULD MY PARTICIPATION BE STOPPED?

Your participation in this study may be stopped at any time by the researcher without your consent for any reason, including:

- The study is stopped or suspended;
- Funding for the study is reduced, stopped or withdrawn;
- If it is in your best interest;
- You do not consent to continue in the study after being told of changes in the research that may affect you;
- You do not follow the study procedures.

6. ARE THERE ANY OTHER OPTIONS?

Your participation is voluntary, so you have the right to decline to participate or to withdraw from this research study at any time without any penalty or loss of benefits to which you would be entitled outside of the study. Choosing not to participate will not affect the care you receive at Cedars-Sinai Health System.

7. WILL MY INFORMATION BE KEPT CONFIDENTIAL?

We will do our best to make sure that the personal information collected as part of this study is kept private. However, we cannot guarantee total privacy. A copy of your research consent and authorization forms may be filed in your electronic medical record at CSMC. Your personal information may be given out if required by law. If information from this study is published or presented at scientific meetings, your name and other identifiable personal information will not be used. Organizations that may look at and/or copy your medical records for research oversight, quality assurance, and data analysis include: accrediting agencies, government and regulatory groups (such as Food and Drug Administration (FDA), Office for Human Research Protections (OHRP), etc.), safety monitors, companies that sponsor the study, and authorized representatives of the sponsor.

8. WHAT IF I BECOME ILL OR INJURED BECAUSE OF TAKING PART IN THIS STUDY?

You will not be in danger of any illness or injury from this research study. However, should you believe that you are ill or have been injured as a result of your participation, please contact the study team at the phone number listed on page 1 of this consent form.

9. FINANCIAL CONSIDERATIONS

Costs of Participation

There will be no cost for you to participate in this study. However, if you elect to receive text message notifications or communications, standard text rates may apply that will not be covered by the study.

Compensation for Participating

You will be paid a $30 gift card for participating in the entirety of the research study at the end of the study.

You may be required to complete a W-9 Form (tax form where you provide your Social Security Number) in order to receive payment. The W-9 Form will be maintained by our accounting department at Cedars-Sinai. Although any amount of payment may be reportable (check with a tax professional if you have questions about your obligations), if total payment by Cedars-Sinai is $600 or more in a calendar year, a 1099 Form will be filed with the IRS in accordance with federal tax law.

If you are a Cedars-Sinai employee, you should provide your employee identification number to the research team so that your payment can be appropriately processed through Payroll. For your own protection and to comply with tax laws, your payment for participation will be reported to the IRS together with other compensation you receive from Cedars-Sinai.

Financial Interest in the Research

The PI and institution have no potential financial conflict of interest with respect to this study.

10. WHAT IF I HAVE QUESTIONS OR PROBLEMS?

Please contact the investigator listed on the first page of this form for questions or concerns about the research. If you have questions, problems, or concerns that you want to discuss with someone who is not associated with this study, or want to offer suggestions or feedback, please contact:

Cedars-Sinai Human Research Protection Program (HRPP)
Phone: (310) 423-3783
Email: ResearchConcerns@cshs.org

The Cedars-Sinai HRPP has been established to protect the rights and welfare of research participants. You may also contact the Cedars-Sinai HRPP if you want to offer input or obtain information regarding the study.

11. CONSENT PROVISIONS

If you sign this form below, it means that:

(1) You have taken the time to carefully read and understand the information presented in this informed consent form; you should discuss it with others, and if appropriate seek a second opinion to make an informed decision;

(2) The information concerning the research study and its involved procedures has been fully explained to you and your questions have been answered to your satisfaction;

(3) You have received and understand all of the information you desire regarding your participation in the research study;

(4) You have considered the potential risks, any anticipated benefits and alternatives (and their relative risks and benefits) of participation;

(5) You are voluntarily agreeing to participate in this research study;

(6) You understand that by consenting to participate in the research, you are not giving up any of your legal rights;

(7) You understand that you have the right to be informed of significant new findings related to this research study which may affect your willingness to continue participating in this study; and

(8) You have been provided with a copy of the "Experimental Subject's Bill of Rights", if applicable to this research study, and have been provided with an opportunity to ask questions regarding the Bill of Rights.

You will receive a signed and dated copy of this form and the Experimental Subject's Bill of Rights.

SIGNATURE PAGE
Consent Form for Research

SIGNATURE BY THE PARTICIPANT: *I hereby agree to participate in the research study described to me during the informed consent process and described in this informed consent form.* ***You will be given a signed copy of this form.***

Name of Participant (Print)	Signature	Date Signed

Optional Contact for Future Research Studies: *I hereby give permission to Dr. Sarah-Jeanne Salvy's research team to contact me about future research studies.*

Name of Participant (Print)	Signature	Date Signed

SIGNATURE BY THE INVESTIGATOR: *I attest that all the elements of informed consent described in this form have been discussed fully in non-technical terms with the participant. I further attest that all questions asked by the participant were answered to the best of my knowledge.*

Name of Investigator (Print)	Signature	Date Signed

CEDARS-SINAI MEDICAL CENTER

APPENDIX: EXPERIMENTAL SUBJECT'S BILL OF RIGHTS

In accordance with California Health and Safety Code 24172, any person who is required to consent to participate as a subject in a research study involving a medical experiment or who is requested to consent on behalf of another has the right to:

1. Be informed of the nature and purpose of the experiment.

2. Be given an explanation of the procedures to be followed in the medical experiment, and any drug or device to be utilized.

3. Be given a description of any attendant discomforts and risks to the subject reasonably to be expected from the experiment.

4. Be given an explanation of any benefits to the subject reasonably to be expected from the experiment, if applicable.

5. Be given a disclosure of any appropriate alternative procedures, drugs or devices that might be advantageous to the subject, and their relative risks and benefits.

6. Be informed of the avenues of medical treatment, if any, available to the subject after the experiment if complications should arise.

7. Be given an opportunity to ask any questions concerning the experiment or the procedure involved.

8. Be instructed that consent to participate in the medical experiment may be withdrawn at any time and the subject may discontinue participation in the medical experiment without prejudice.

9. Be given a copy of any signed and dated written consent form used in relation to the experiment.

10. Be given the opportunity to decide to consent or not to consent to a medical experiment without the intervention of any element of force, fraud, deceit, duress, coercion, or undue influence on the subject's decision.