EVALUATING THE EFFECTS OF CLIENT-SET VERSUS COACH-SET GOALS IN THE CONTEXT OF A HEALTH-COACHING INTERVENTION FOR PHYSICAL ACTIVITY

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EVALUATING THE EFFECTS OF CLIENT-SET VERSUS COACH-SET GOALS IN THE CONTEXT OF A HEALTH-COACHING INTERVENTION FOR PHYSICAL ACTIVITY

By

J. Logan Gibson

A Thesis Submitted to
the Graduate School
In Partial Fulfillment of the
Requirements for the Degree of
MASTER OF ARTS

College of the Pacific
Behavioral Psychology

University of the Pacific
Stockton, California
2022
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By

J. Logan Gibson
DEDICATION

This thesis is dedicated to my grandfather Reuben C. Gibson, who never tired of my endless questions, or at least didn’t show it.
ACKNOWLEDGMENTS

My sincerest thanks go to Dr. Matthew Normand for accepting the challenge of training an exercise physiologist in the science of behavior from scratch. The first time we spoke, I stated my goal of becoming a research scientist, and his efforts in the classroom, lab, and private conversations demonstrate that he also held that goal for me. I am happy to call him a mentor and, hopefully someday, a colleague. I would also like to express my gratitude to Dr. Carolynn Kohn for her contributions as an instructor, clinical supervisor, and member of my thesis committee, and to Dr. Corey Stocco for his contributions as an instructor, supervising course lecturer, and member of my thesis committee. The previously mentioned faculty went above and beyond their responsibilities toward my professional development. Finally, I would like to acknowledge Holly White and Sophia Hansen for their contributions to my training as a scientist-practitioner. Their level of consistent effort does not seem typical in the industry.
EVALUATING THE EFFECTS OF CLIENT-SET VERSUS COACH-SET GOALS IN THE CONTEXT OF A HEALTH-COACHING INTERVENTION FOR PHYSICAL ACTIVITY

Abstract

By J. Logan Gibson

University of the Pacific
2022

Decreased physical activity is likely related to an increase in conditions such as cardiovascular disease, stroke, and diabetes. Physicians recommend increasing physical activity as a prophylactic against these lifestyle diseases. However, most cannot help their patients change their daily behavior. Behavior analysts have demonstrated that they can change daily physical activity by setting goals and arranging consequences for their participants. However, they are not currently being hired to do so within the health care industry. Additional training may make behavior analysts more marketable in health care, such as that provided to health coaches. A core claim in health coaching is that client-led interventions are more successful than interventions wherein goals are set by a coach. To investigate this claim, we used multiple baseline across participants with a changing criterion design. Within the context of a health coaching intervention, we exposed participants to a client-set goal condition, a coach-set goal condition, and a choice condition where they were allowed to choose from the two previous conditions. Although physical activity increased for all participants during the intervention, there was no difference between client-set and coach-set goals. However, all participants chose client-set goals, which may speak to the social validity of this approach.
TABLE OF CONTENTS

List of Tables .............................................................................................................................................9
List of Figures .............................................................................................................................................10
List of Abbreviations .................................................................................................................................11
Chapter 1: Introduction ...............................................................................................................................12
  Physical Activity: Benefits and Recommendations ..............................................................................12
  The Applied Behavior Analytic Approach .............................................................................................13
  The Health Coaching Approach .............................................................................................................15
  Health Coaching Research .....................................................................................................................18
  Two Approaches and the Origin of Goals ..............................................................................................19
Chapter 2: Method ......................................................................................................................................21
  Participants .............................................................................................................................................21
  Setting and Materials .............................................................................................................................22
  Response Measurement and Reliability .................................................................................................22
  Procedure .............................................................................................................................................23
    Screening .............................................................................................................................................24
    Initial Health Coaching Session .......................................................................................................25
    Fitbit (Phase 1) ..................................................................................................................................25
    Fitbit with Participant-Set Goals (Phase 2) .........................................................................................26
    Fitbit with Experimenter-Set Goals (Phase 3) ....................................................................................27
    Choice – Experimenter-Set Goals or Self-Set Goals (Phase 4) ......................................................27
  Data Analysis .......................................................................................................................................28
LIST OF TABLES

Table

1. Descriptive Statistics.................................................................34
2. Qualitative Interview information.............................................39
LIST OF FIGURES

Figure

1. Participant steps per day .................................................................31
2. Participant steps per week.................................................................32
3. Active minutes per day ...................................................................36
4. Pearson correlation coefficients for steps per day and active minutes per day ........................................................................37
5. Social validity survey .......................................................................38
# LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE</td>
<td>American Council on Exercise</td>
</tr>
<tr>
<td>CALR-Q</td>
<td>Change in Activity Levels Readiness Quiz</td>
</tr>
<tr>
<td>CM</td>
<td>Contingency Management</td>
</tr>
<tr>
<td>MI</td>
<td>Motivational Interviewing</td>
</tr>
<tr>
<td>PAR-Q</td>
<td>Physical Activity Readiness Questionnaire</td>
</tr>
<tr>
<td>PDB</td>
<td>Percentage difference from baseline</td>
</tr>
<tr>
<td>PDP</td>
<td>Percentage difference from the previous phase</td>
</tr>
<tr>
<td>PND</td>
<td>Percentage of non-overlapping data</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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</table>
Physical Activity: Benefits and Recommendations

Engaging in physical activity holds profuse benefits for people throughout their lives. From childhood to old age, increased physical activity is positively associated with longevity (Denham et al., 2016), musculoskeletal health (Santos et al., 2017), and optimal mental health (Stubbs et al., 2018), and is negatively associated with a wide range of problematic health conditions (Carbone et al., 2019; Denham et al., 2016; Green et al., 2017). Exercise has been shown to reduce risk of premature death due to cardiovascular disease (Thompson, 2003), stroke, diabetes (Garber et al., 2011), and cancer (Bhaskaran et al., 2014; Lee et al., 2012), reduce anxiety and depression (Carek et al., 2011), while improving bone health (Benedetti et al., 2018).

Exercise is good for us. However, although the health benefits of exercise are clear (U.S. Department of Health and Human Services, 2018), 77.1% of Americans do not get enough structured physical activity (Blackwell & Clark, 2018).

How much exercise do we need? One metric commonly used for measuring physical activity is steps per day as research suggests that daily step count is negatively correlated with carrying excess weight (Bassett et al., 2010) and mortality (Saint-Maurice et al., 2020). However, peaking in childhood and subsequently declining, few American adults take the recommended 10,000 steps per day (Bassett et al., 2010; Bohannon, 2007; Tudor-Locke et al., 2010). Although individual goals require tailored exercise prescriptions, the U.S. Department of Health and Human Services recommends that healthy individuals should engage in at least 150 min of moderate-intensity aerobic activity and at least two resistance training sessions per week.
to experience a lower risk of premature death, heart disease, and diabetes (U.S. Department of Health and Human Services, 2018, p.8).

The widespread failure to meet minimal physical activity guidelines has yielded an unfortunate consequence that is not limited to the U.S. As the fourth leading cause of mortality worldwide, physical inactivity is a global health crisis according to the World Health Organization (WHO). This troubling state of affairs stems, in part, from the estimated 17.9 million deaths each year from cardiovascular disease; the 1.6 million, and rising, yearly deaths from diabetes; and 5.5 million yearly deaths from stroke (Beaglehole et al., 2011; Johnson et al., 2016; Kohl et al., 2012; WHO, 2010, 2011). The cause of these deaths is likely multifaceted, however, the impact of individual behavior on health should not be ignored (Kaplan, 1990).

Despite its strengths, the modern medical model may not address the aforementioned relevance of behavior. Although improvements have been seen in the last 30 years, physicians spend very little time discussing health issues with their patients, and they often overestimate the amount of time they do spend (Tai-Seale et al., 2007; Waitzkin, 1984). Interestingly, unless a patient makes an appointment with the specific goal in mind, very little time is spent discussing personal habits (Tai-Seale et al., 2007). These factors could help explain why patients often leave medical appointments without a clear understanding of how to make healthy changes to their everyday behavior (Schillinger et al., 2003, 2006. Of course, physicians are not specifically trained to use behavior change strategies. As such, there seems to be a need for a trained behavior change agent that focuses on health-related behavior.

**The Applied Behavior Analytic Approach**

Behavior analysts are trained to use behavior change strategies, and the applied behavior analysis research literature contains many evidence-based approaches that could be used to help
people change their health habits for the better. To name just a few, task clarification, self-monitoring, goal setting, and feedback have been used, singly and jointly, to change a wide range of behaviors, including those related to health (Brown et al., 1980; Donaldson & Normand, 2009; Donlin et al., 2014; Kurti & Dallery, 2013; Normand, 2008; Smith & Ward, 2006; VanWormer, 2004; Wack et al., 2014; Williamson, 2017; Zarate et al., 2019). By setting clearly understood goals, allowing the participant to track their own progress, attempting to reinforce the target response, and systematically increasing the magnitude of behavior change over time, participants are able to contact environmental contingencies that evoke and maintain progressively higher rates of behavior (Donaldson & Normand, 2009; Kurti & Dallery, 2013; Normand, 2008; Zarate, et al., 2019).

A characteristic feature of behavior analytic research is the use of single-case designs, which can provide valid and reliable information about individual behavior, thus informing tailored health care interventions (Morgan & Morgan, 2001; Normand & Bober, 2020). Moreover, in the behavior analytic studies cited above, the researchers, rather than the participant, arrange relevant goals to shape health behavior and provide contingent consequences (Donaldson & Normand, 2009; Kurti & Dallery, 2013; Normand, 2008; VanWormer, 2004; Wack et al., 2014; Zarate et al., 2019). Whether researchers set goals using a percentile schedule of reinforcement (Galbicka, 1994; Kurti and Dallery, 2013), which uses an ordinal distribution to determine when experimenters should reinforce successive approximations, a percentile-based increase (Donaldson & Normand, 2009; Zarate et al., 2019), or increases based on previous averages (Normand, 2008), a key element of these studies is that the experimenter explicitly leads the goal setting intervention. The reported results of these studies suggest that this is an effective approach.
The Health Coaching Approach

Although behavior analysts have demonstrated ways to change health-related behavior, these strategies have not been widely adopted and health care professionals are not currently hiring behavior analysts (Normand & Bober, 2020). If behavior analysts want to perform the function of a behavior change agent within the modern medical model, they may need to seek additional credentials to fill these gaps (Normand & Kohn, 2013). Health coaching is a relatively new discipline that could help to address relevant health issues by focusing on day-to-day habits. The American Council on Exercise (ACE), one of the largest certifying bodies for health coaches, defines a health coach as, “an advanced fitness professional” responsible for helping “a wide variety of individuals… adopt structured behavior-change programs that focus on… physical activity, nutrition, and education necessary to improve and maintain health” (Normand & Bober, 2020). Generally speaking, health coaches use a combination of behavioral interventions to teach their clients how to make health-related behavior changes.

Health coach training involves basic education related to exercise, nutrition, lifestyle diseases, health assessments, and professional collaboration, along with foundational psychological principles that are thought to influence engagement in health behaviors (ACE, 2017; Wolever et al., 2013). Would-be health coaches receive information on operant conditioning (ACE, 2017, p. 52; e.g., Skinner, 1953, 1957), psychology of personality (ACE, 2017, p.100; e.g., Steyer et al., 1990), and social learning theory (Health Sciences Institute [HSI], 2020, p. 284; e.g., Rotter, 1960), along with a heavy emphasis on the use of the transtheoretical model of behavior change (ACE, 2017, p. 57; HSI, 2020, p. 286; Prochaska & Diclemente, 1983). Health coaches are taught to use task clarification, goal setting (ACE, 2017, p.361), self-monitoring, and feedback (ACE, 2017, p. 390). However, in contrast with the behavior analytic
approach, health coaches promulgate the client-centered model (ACE, 2017, p. 2)– one aspect of this being the use of client-set goals (ACE, 2017, p. 364). Thus, rather than setting a physical activity goal, for example, the health coach attempts to clarify the client’s own goal as part of a collaborative process and contrive some consequences to deliver based on performance (HSI, 2020, p. 297). According to the Health Science Institute, the benefits of this approach, in the context of health coaching, are limited to anecdotal reports from health coaches (HSI, 2020, p. 297). Although health coaching sessions can differ based on who is providing the service, there are some commonalities seen amongst practitioners.

A typical health coaching session begins with a brief greeting followed by any necessary contract paperwork. The health coach typically uses Motivational Interviewing (MI), whereby they ask the client to describe details about their past health-related behavior, and then highlight the client’s reported victories. During MI, the health coach uses the O.A.R.S. strategy (Miller & Rollnick, 2002), which consists of open-ended questions (ACE, 2017, p. 108), affirmations (ACE, 2017, p.110), reflective listening (ACE, 2017, p.115), and summarizing (ACE, 2017, 112), and is meant to establish contingencies that will increase reliable and accurate verbal behavior from the client (Christopher & Dougher, 2009), thus better informing the intervention. MI has been shown to increase client retention and engagement, thereby working in synergy with other interventions to improve treatment effects (Carroll et al., 2006; Miller & Rollnick, 2004; Secades-Villa et al., 2004).

Depending on the training program, the health coach has at their disposal a variety of forms that can be used to organize the client’s reported health and fitness history, two such examples are the Behavioral Outline (ACE, 2017, p. 284) and Change in Level of Readiness quiz (CALR-quiz; ACE, 2017, p. 278). A behavioral outline is a questionnaire that prompts the
health coach to ask for description information related to specifics such as which behaviors will be targeted, the client’s current behavior, and potential barriers to improving these behaviors. The underlying rationale behind CALR-quiz is that a client can be staged into specific categories of readiness to change their behavior. The quiz asks questions such as “I think becoming more active will solve other problems in my life.” A client's answers are quantified and the results are used by the health coach to adjust their counseling strategy. To end the initial session, the health coach would schedule the client's next weekly session and thank them for their time and effort. The initial health coaching meeting typically last 30-60 min (Wolever et al., 2013).

The weekly sessions are typically shorter than an initial session, lasting approximately 30 min. During a weekly session, the health coach prompts the client to discuss specific weekly goals, while providing feedback in a judgment-free manner, followed by a review of the client’s long-term goals and level of commitment. After the review, the health coach would assist the client in setting new goals using the S.M.A.R.T. goal paradigm (Doran, 1981). Originally discussed in the context of workplace management, the use of the S.M.A.R.T. model of goal setting is frequently discussed in health coaching curricula (e.g., ACE, 2017, p. 361). S.M.A.R.T.—which stands for specific, measurable, attainable, relevant, and time-bound—goals are said to be more effective as they provide the framework for a well-constructed and realistic goal. (ACE, 2017, p.362). Health coaches also provide information about potential consequences for achieving, or failing to achieve, the goals that are set, and then provide feedback about goal progress (ACE, 2017, p.53). Finally, the health coach thanks the client for their participation, asks the client for feedback, and schedules the next session. (Moore et al., 2016).
Health Coaching Research

Some research suggests that health coaching can positively impact a variety of health-related biomarkers, such as HbA1c (Damiri et al., 2019; Wayne & Ritvo, 2014; Wolever et al., 2010), body weight (Leahey & Wing, 2013; Merrill et al., 2010; Steelman, 2016), and blood pressure (Kemper et al., 1990; Margolius et al., 2012). They have used it with adults, children (Jefferson et al., 2011), pregnant women (Hill et al., 2016), and the elderly (Holland et al., 2003), as well as patients diagnosed with overweight and obesity (Merrill et al., 2010), diabetes (Everett et al., 2018; Krok-Schoen et al., 2015; Wayne & Ritvo, 2014), heart disease (Margolius et al., 2012), chronic illness, and HIV (Corado et al., 2018). Additionally, health coaching shows promise for addressing the problems of rising health care costs (Fedesco, et al., 2018; Finkelstein et al., 2009) and the shortage of primary care physicians (Willard-Grace et al., 2015), as it’s use is correlated with reduced healthcare expenditures (Jonk et al., 2015; Wennberg et al., 2010). These points bode well for health coaching as a practice; however, a review of the health coaching literature highlights some empirical issues.

Most of the research that investigates the effects of health coaching consists of group designs, which might be sufficient for technique testing within a population; however, health coaching is primarily concerned with developing techniques that work best for the individual (Normand & Bober, 2020) and, thus, a single case approach would permit a more valid investigation (Morgan & Morgan, 2001). For example, if a health coach wanted to evaluate whether a particular intervention affected a client’s level of physical activity, the critical comparison would be between that client’s pre- and post-intervention behavior, not between the difference in means of health-coached groups versus uncoached groups. In other words, when viewing only an average effect from a group, individual differences in behavior are lost.
Furthermore, many health coaching studies rely on self-report of the target behavior or measurement of some related health metric, or both, rather than directly measuring behavior (e.g., Corado et al., 2018; Coughlin et al., 2020; Dwinger et al., 2020; Valentin-Ayala & Bernstein, 2020; Willard-Grace et al., 2015).

To further obscure matters, the procedures involved in health coaching studies are often inconsistently defined and described (Wolever et al., 2013). Wolever et al. (2013) found that of 284 health coaching studies examined, only 22% described the amount of training undertaken by those performing the role of the health coach (p. 49). Of the 22%, there was a large discrepancy in the duration of the training received by the health coach, ranging from 2 hrs to 2 yrs (p. 49).

The length of the individual coaching sessions making up the intervention vary considerably as well. Although only 25% of the articles stated the length of each coaching session used, those that did report session lengths ranging from 5 min to 2.5 hrs (Wolever et al., 2013, p. 47). These factors lead to a question of construct validity, in that each study claims to investigate a health coaching intervention while operating without a standard set of parameters. More research is needed, which would investigate the promising association between health coaching and health outcomes, while addressing these empirical shortcomings.

**Two Approaches and the Origin of Goals**

We have reviewed two approaches to promoting health-related behavior change. In the applied behavior analytic approach, we have evidence suggesting that the package intervention consisting of task clarification, self-monitoring, experimenter-led goal-setting, and feedback effectively increases physical activity. The behavior analytic researchers used single-case designs, which provide valid information about the individual and add flexibility to intervention strategies (Morgan & Morgan, 2001), along with replicable systems for setting goals. However,
these findings have not been demonstrated in the context of a health care practice. With health coaching, we have an approach to behavior change that is gaining acceptance in health care and uses some of the evidence-based procedures from behavior analysis. However, the research methods used lead to questions about the validity and reliability of the research base. Furthermore, the claim that client-set goals are effective has not been empirically investigated. A critical distinction between these approaches is the source of the goal used during the goal-setting intervention.

The purpose of this study is to investigate the practice of setting one’s own goals, which we see in health coaching interventions, followed by a percentile schedule, set by experimenters, and finally a “choice” phase in which participants select either to continue having their goals set for them or to return to setting their own goals. Furthermore, to identify effective components of a package intervention, we must manipulate isolated factors, holding others constant, while using consistent concepts, definitions, and levels of analysis to allow for replicability. Thus, we will add to the current body of health coaching literature by attempting to simulate, as much as we can, components of a standardized health coaching intervention. Finally, the methodological technology of within-subject research design and visual inspection of data, commonly used in applied behavior analysis, can provide another lens with which to examine the effects of health coaching interventions.
CHAPTER 2: METHOD

Participants

Participants were recruited via the University of the Pacific Student Health Services Instagram page. The online recruitment post described the required qualifications of participants, potential benefits to the participants, and contact information of the principal investigator (Appendix A). Applicants who responded first completed a brief phone interview with the principal investigator, followed by an online screening process wherein they were asked about their medical and exercise histories. The interviewer observed the potential participants complete electronic versions of the CALR-quiz\(^1\) (Appendix B) and the Physical Activity Readiness Questionnaire (PAR-Q; Appendix C), and also verified that the participant had sufficient internet access to participate. Applicants who met the inclusion criteria (see below) were invited to attend a subsequent online meeting that served as the initial health-coaching session (see “Initial 1-Hr Session”).

Eligible participants were 18-55 years old with reliable internet access, and participation was open to individuals of all ethnicities, genders, and educational backgrounds. Exclusionary criteria consisted of (a) having a major surgical procedure within the previous 6 weeks, (b) answering “Yes” to any question on the PAR-Q, (c) otherwise indicating high risk for a cardiovascular incident. Participants were 3 female, full-time college students, between 18 and 24 years of age. Two participants reported their ethnicity as Hispanic and one reported her ethnicity as Asian. Two of three participants reported an annual household income between $35,000 and $49,999 with the remaining participant reporting greater than $200,000. We

\(1\) The original CALR-quiz was designed to assess weight loss readiness. We modified this assessment to reflect a readiness to engage in physical activity.
provided informed consent forms and explained the purpose and procedures of the study prior to participation. The local institutional review board approved all study procedures.

**Setting and Materials**

We conducted the screening session, the initial 60-min health coaching session, and subsequent 30-min coaching sessions (see below) using a university-approved video conferencing platform (Zoom). To approximate what one might experience as a health coaching client, we used the previously mentioned Behavioral Outline form and the CALR-quiz, taken from the ACE Health Coaching Manual. Planned session duration was based on the 35.8-min average duration of health coaching sessions reported by Wolever et al., (2013). However, as health coaches typically discuss other health issues in addition to physical activity (i.e., diet, medication adherence, sleep), actual session durations were 15–30 min. Participants could participate in these telehealth meetings from any private, distraction-free location that was convenient for them. Delivery of all necessary materials, such as forms and Fitbit devices, was contactless. Participants accessed the video conferencing platform via smartphone or laptop, and none required training to do so. Activity data were recorded by a wearable fitness tracker (Fitbit Flex). No participant chose to have us measure secondary dependent variables such as their weight, blood pressure, or blood glucose.

**Response Measurement and Reliability**

A permanent-product recording system was used to measure daily steps throughout the experiment. The permanent products related to the primary dependent variable (steps per day, “active minutes”) were automatically recorded by the Fitbit. Fitbit defines active minutes as 10 min or more of continuous moderate-to-vigorous physical activity (Fitbit Help, n.d.). We used Prism to conduct a Pearson correlational analysis between steps per day and active minutes.
Prism uses the values from the X (steps) and Y (active minutes) axes to determine the extent to which each value varies together, or correlates. Outcomes from this analysis are provided in the Results section of this document in the form of Pearson’s r and the associated p values.

The step function of all Fitbits were validated by the lead experimenter and 3 research assistants. The lead experimenter wore all Fitbit devices simultaneously and walked 100 steps. Three research assistants, who did not know how many steps the experimenter had taken, each observed three videos, and counted the steps observed. We calculated interobserver agreement by dividing all possible responses by all correct responses and multiplying by 100. IOA was 100% across all videos. Error among the devices was calculated by dividing the number of steps recorded by the Fitbit by the number of steps directly observed and multiplying by 100. An average error among all devices was calculated, resulting in an error range of 10 steps and a mean error of 3.83%. For a participant taking 10,000 steps per day, this would translate to an average error of 383 steps.

**Procedure**

Participants met weekly with the experimenter, an ACE certified health coach, for a maximum of 15 experimental sessions: a 60-min initial session, twelve 30-min health-coaching sessions, and 1-2 additional social-validity sessions (if they chose to do so). For the entirety of the experiment, participants had access to their step counts via the Fitbit website, thus the data was accessible; however, they were not specifically instructed to monitor their data. The 12 weeks of health-coaching sessions involved various intervention strategies introduced across time, including self-monitoring, accessible self-monitoring with participant-set goals and feedback, accessible self-monitoring with experimenter-set goals and feedback, and a choice phase where participants could select their own goals or have the experimenter continue to set
them. In all goal setting phases (2-4), the experimenter delivered contingent feedback based on whether the participant met their weekly step goal. During all phases, we discussed goals in both a weekly and daily format so that participants could monitor their goal, according to their preference. We used a non-concurrent multiple-baseline across participants design, with an embedded changing criterion design, to investigate the goal-setting strategies. All decisions to change phases were based on a steady state strategy with the criteria that there was minimal visible variance in the level, trend, and variability of the data (Sidman, 1988, p. 35).

**Screening**

Following a brief phone call, the experimenter met with the participants for an initial screening session. Prior to the screening session, the experimenter emailed the Change in Activity Level Readiness quiz and the Physical Activity Readiness Questionnaire to the participant. During the screening session, the experimenter greeted the participant via Zoom and helped them complete the appropriate forms. All required signatures were collected electronically. During the screening we explained that this is a study investigating physical activity levels and more specifically, steps taken per day. The scoring sheet from the CALR-quiz states that a score of an 8 or above indicates that the participant has “good reasons” for wanting to change and has an “understanding of the steps needed to succeed” (see below). The validity of the assessment has not been empirically established, but we included it to be consistent with suggested health coaching practices (ACE, 2017, p. 277). Participants who scored an 8 or above on the CALR-quiz, stated a desire to increase their steps per day, met the medical criteria, based on the PAR-Q, and had a stable internet connection were invited to participate in the study.


**Initial Health Coaching Session**

Prior to the initial session the experimenter emailed the demographic questionnaire (Appendix D), consent form (Appendix E), and mailed the Fitbits to participants, via USPS, and during the session the participants were observed filling out forms and familiarized with the device. To begin the initial 1-hr health coaching session (Appendix F) the experimenter introduced himself and briefly described his role as a health coach. We then discussed the popular recommendation of 10,000 steps per day (though no specific step goal was set) and provided each participant the general recommendations on exercise from the U.S. Department of Health and Human Services (2018). Non-physical activity-related goals such as diet, smoking, stress reduction, and sleep quality were not addressed for purposes of this study. However, the experimenter offered easily accessible educational materials (see Appendix G).

Next, the experimenter engaged the participant in a standardized motivational interview with a focus on health (Appendix H), wherein he asked questions related to why the participant would like to increase their level of physical activity. Motivating factors such as health, life quality, and past successes were discussed. This was followed by the experimenter filling out a Behavioral Outline (Appendix I). At the end of this session, the participant was told that they were to begin wearing the Fitbit immediately to “get in the habit” of wearing the device and that they should make no additional changes to their behavior. A health coaching session was then scheduled for between 1 and 3 weeks in the future.

**Fitbit (Phase 1)**

During the self-monitoring phase, which we treated as our baseline, participants were not instructed to monitor their daily step count. However, they were able to receive performance feedback by self-monitoring their activity using their Fitbit. As such, baseline provides
information about their level of physical activity absent goal setting and tailored feedback, but not absent self-monitoring. The baseline phase continued for 7 (P1), 15 (P2), and 21 (P3) days.

**Fitbit with Participant-Set Goals (Phase 2)**

Following days 7, 15, and 21, participants met with the experimenter for their scheduled 30-min telehealth-coaching session (see Appendix J). During the online session, the experimenter assessed, via interview, the participant’s goals, health-related values, and barriers to behavior change. During the initial meeting in Phase 2, the experimenter modeled S.M.A.R.T. goal setting asked the participants to describe the related concepts, which also were reviewed in subsequent goal-setting sessions. In each session, participants were prompted to set their own physical activity goals and in the sessions that followed, the experimenter delivered feedback based on whether the participant met, or failed to meet, the self-established goal. For example, if a participant met their weekly goal, the experimenter stated that the goal was met and provided praise (e.g., “You met your goal of walking 20,000 steps this week, great job!”). If the weekly goal was not met, the experimenter stated that the goal was not met and provide a prompt (e.g., You didn’t reach your goal of walking 20,000 steps this week. Let’s dig deep and try again next week!”; see Appendix K). If a participant described a barrier to behavior change, the experimenter led them though a problem-solving exercise wherein they were asked to list potential solutions, weigh the pros and cons of each solution, choose one solution, and state a time to enact it. The participant-set goal phase lasted for 6 weeks (P1), 4 weeks (P2), and 6 weeks (P3).
Fitbit with Experimenter-Set Goals (Phase 3)

In Phase 3 we began setting goals for the participants using a modified percentile schedule of reinforcement (Galbicka, 1994; Kurti & Dallery, 2013; see Appendix L). We used the mathematical formula \( k = (m+1) (1-w) \) to determine whether to provide praise or encouraging statements. The experimental criterion variable \((w)\) was set to .4 to allow for praise following 40% of the participant’s attempts. The number of previously observed attempts \((m)\) was set at 4 to include half of the previous phases attempts for the initial goal of the new phase. For example, during the last four weeks of the client-set goal phase, participant 1 walked 8257, 8616, 8612 and 8617 steps. The ranks for these attempts were rank 1 = 8612 steps; rank 2 = 8616 steps; rank 3 = 8617 steps; and rank 4 = 8976 steps. Being that \( k = (4+1) (1-.4) = 3 \), the participant’s new attempt had to be greater than rank 3 (8616 steps) in order to receive praise.

The following week, with the number of previously observed attempts remaining static at 4, the new rank \((k)\) included the final 3 attempts from phase 1 and the first attempt from phase 2. This progression repeated throughout the remainder of the intervention. The one caveat to the percentile schedule formula is that, aside from the first week of the intervention, no goal was set that was lower than a previously set goal. Problem solving and feedback were delivered in the same manner as in Phase 2. For participants 1, 2, and 3, the experimenter-set goal phase lasted for 6 weeks (P1), 5 weeks (P2), and 5 weeks (P3) (see Appendix M).

Choice – Experimenter-set goals or Self-set Goals (Phase 4)

Following Phase 3, we began the self-monitoring with choice, and experimenter feedback phase. During this phase, participants were prompted to choose to either continue with experimenter-set goals, based on the modified percentile schedule of reinforcement, or return to self-set goals. We delivered contingent feedback in the same way as the previous phases. This
phase lasted for 2 weeks (P1), 4 weeks (P2), and 2 weeks (P4). During Phase 4 we began assessing for social validity; as such, participants were asked if they would like to continue the intervention beyond the originally agreed upon 14 weeks (see Social Validity section for details and rationale). We presented this option following 1 week of Phase 4 for participant 1, 2 weeks for participant 2, and at the outset of Phase 4 for participant 3.

**Data Analysis**

We investigated potential causal relations by visual analysis of the data. However, to quantify the degree of change, we also calculated three descriptive statistics: percentage difference from the previous phase (PDP), percentage difference from baseline (PDB), and percentage of non-overlapping data (PND). The PDP quantifies any difference between each phase and the previous phase. To analyze the PDP, we calculated the mean steps per day (MSPD) for each participant across all phases. Next, we subtracted the previous phase’s mean steps per day from the mean steps per day of the phase analyzed, divided that number by the previous phase’s MSPD, and multiplied that number by 100. The PDB quantifies any difference between each phase and the baseline phase. To analyze the PDB, we subtracted MSPD from the baseline phase from the mean steps per day of the phase analyzed, divided that number by the mean steps calculated during baseline, and multiplied that number by 100. The PND tells us how many data points are higher than the data points from the previous phase and is considered a measure of effect size (Jessel et al., 2019). To calculate the PND, we counted the number of data points in each phase, excluding baseline, higher than the highest datum in the previous phase. The number of data points higher than the highest data in the previous phase was divided by the total number of data points in this phase and multiplied by 100.
Social Validity

Prior to the study, we recorded two health coaching sessions with a confederate. Each consisted of 22 min of an initial session and 12 min of a follow-up session. We provided the videos to an impartial third-party volunteer who was a practicing health coach. The health coach completed an acceptability survey for each video. The survey was a Likert-type scale that contained 18 questions such as “I found the procedures used during the health coaching to be an acceptable way to relay important information.” Other survey questions were related to the use of S.M.A.R.T. goals, motivational interviewing, summarizing, reflective listening, and other strategies used in health coaching. Scoring ranged from strongly disagree (1) to strongly agree (7). There were no reverse-scored questions with a total possible score of 126. After watching recorded health coaching sessions, the independent health coach scored the acceptability of the sessions 91/126 – all scores were either neutral or positive. These results can be found in Appendix O.

As a direct measure of social validity, following the originally agreed upon 14-week intervention, participants were given the option to continue the health-coaching intervention for an additional 1-2 weeks. If accepted the participant continued to receive weekly tele-health coaching sessions wherein goals were reviewed, new goals were set, and on-going progress was monitored. Additionally, the option to choose the source of the goal in Phase 4 can be seen as an additional social validity measure, and participant responses might provide useful information about the acceptability of the procedures used (Wolf, 1978). Finally, during the final session, we asked participants six open-ended questions; their responses were recorded, and following the final session, we emailed participants a social validity questionnaire. The questionnaire was intended to determine whether the participants were satisfied with the health-coaching
intervention and assess whether they would use it in the future. The survey used a 5-point Likert-type scale with positively and negatively scored questions. For example, question one is, “I believe that the health-coaching sessions helped me reach my weekly goals.”, which could be scored with a “1” indicating that they disagreed with the statement or a “5” indicating that they agreed with the statement. While question five is, “The exercise protocol was too challenging.”, which could be scored with a “5” indicating that they disagreed, or a “1” indicating that they disagreed with the statement.
CHAPTER 3: RESULTS

We used a multiple-baseline across participants, with an embedded changing-criterion design. Figure 1 depicts each participant’s daily step totals, while Figure 2 depicts weekly step totals. Visual analysis of the weekly step totals shows an overall increasing trend from the onset of the self-set goal phase to the end of the study, with the exception of participant 3, whose

![Graph depicting daily and weekly steps for participants.](image)

*Figure 1.* The graph depicts participant steps per day. Box plots depict daily goals met (filled) and missed (empty). In the Choice phase, participant selection is indicated in the gray box.
Figure 2. The graph depicts weekly step totals for each participant.
behavior change might be explained by external events\textsuperscript{2}. Again, with the exception of participant 3, we see no clear differentiation across the self-set and experimenter-set goal phases. During the participant-set goal phase, the data for participant 1 meets or exceeds her self-set goals on most days. During the experimenter-set goal phase and the choice phase, her steps per day varied more, overall. The steps per day for participant 2 became increasingly variable throughout the study, as her highest and lowest weekly step totals are seen during the last four weeks. Perhaps the most robust effect is seen in the daily steps for participant 3 during the participant-set goal phase. Her steps increased gradually and tracked her goals. During the experimenter-set goal phase, her daily steps decreased dramatically and remained low and variable for the remainder of the study; however, we cannot eliminate the potential alternative explanations for this change in behavior. The majority of daily steps meeting criterion were higher early in the study, though for participant 2 they remained highly variable throughout (Figure 1).

In aggregate, the data suggest that all participants took more steps in the three goal-setting phases compared to baseline. Increases ranged from 68\% to 98\% (Mdn = 78\%) from baseline averages to the highest weekly averages during experimenter-set goal phase even though participants only met between 46\% (P2 and P3) and 71\% (P1) of their weekly goals throughout the study. Daily steps remained highly variable for participants 1 and 2 throughout the study, with maximum weekly ranges of 11955 and 18890 steps, respectively. Participant 3’s steps per day remained steady at or above the goal until one week after the experimenter-set goal phase began, when steps decreased and became more variable, with a maximum weekly range of

\footnote{In the second week of experimenter-set goals, participant 3 left the University and relocated to Arizona, where she reported temperatures of 116°F. Although she still attended her weekly sessions, this may have affected her involvement in the study, and could provide alternative explanations for her behavior.}
Goals met are displayed in Table 1. Participant 1 met 6 out of 6 goals in the participant-set goal phase, 3 out of 6 in the experimenter-set goal phase, and 1 out of 2 in the choice phase. Participant 2 met 2 out of 4 goals in the participant-set goal phase, 3 out of 5 in the experimenter set goal phase, and 1 out of 4 in the choice phase. Participant 3 met 5 out of 6 goals in the participant-set goal phase, 1 out of 5 in the experimenter-set goal phase, and 0 out of 2 in the choice phase.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Participant Set</th>
<th>Experimenter Set</th>
<th>Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participant 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days in phase</td>
<td>7</td>
<td>42</td>
<td>42</td>
<td>143</td>
</tr>
<tr>
<td>Avg. Steps pd.</td>
<td>5240</td>
<td>7722</td>
<td>8262</td>
<td>9541</td>
</tr>
<tr>
<td>% Change</td>
<td>-</td>
<td>47%</td>
<td>7%</td>
<td>15%</td>
</tr>
<tr>
<td>PDP</td>
<td>-</td>
<td>47%</td>
<td>7%</td>
<td>15%</td>
</tr>
<tr>
<td>PDB</td>
<td>-</td>
<td>47%</td>
<td>58%</td>
<td>82%</td>
</tr>
<tr>
<td>PND</td>
<td>-</td>
<td>55%</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>Weekly Goals Met</td>
<td>6/6</td>
<td>3/6</td>
<td></td>
<td>1/2</td>
</tr>
<tr>
<td><strong>Participant 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days in phase</td>
<td>15</td>
<td>28</td>
<td>35</td>
<td>28</td>
</tr>
<tr>
<td>Avg. Steps pd.</td>
<td>6527</td>
<td>7230</td>
<td>7239</td>
<td>7968</td>
</tr>
<tr>
<td>% Change</td>
<td>-</td>
<td>11%</td>
<td>0%</td>
<td>10%</td>
</tr>
<tr>
<td>PDP</td>
<td>-</td>
<td>11%</td>
<td>11%</td>
<td>22%</td>
</tr>
<tr>
<td>PDB</td>
<td>-</td>
<td>0%</td>
<td>3%</td>
<td>11%</td>
</tr>
<tr>
<td>PND</td>
<td>-</td>
<td>2/4</td>
<td>3/5</td>
<td>1/4</td>
</tr>
<tr>
<td><strong>Participant 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days in phase</td>
<td>21</td>
<td>42</td>
<td>35</td>
<td>14</td>
</tr>
<tr>
<td>Avg. Steps pd.</td>
<td>9996</td>
<td>14700</td>
<td>9089</td>
<td>3188</td>
</tr>
<tr>
<td>% Change</td>
<td>-</td>
<td>47%</td>
<td>-38%</td>
<td>-65%</td>
</tr>
<tr>
<td>PDP</td>
<td>-</td>
<td>47%</td>
<td>-9%</td>
<td>-68%</td>
</tr>
<tr>
<td>PDB</td>
<td>-</td>
<td>98%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>PND</td>
<td>-</td>
<td>5/6</td>
<td>1/5</td>
<td>0/2</td>
</tr>
</tbody>
</table>
Descriptive statistics are reported in Table 1. The PDB for participant 1 was 47%, 58%, and 82% for the participant-set phase, experimenter-set phase, and choice phase, respectively. For participant 2, the PDB was 11% in the participant-set goal phase, 11% in the experimenter set goal phase, and 22% in the choice phase. For participant 3, the PDB was 47% in the participant-set goal phase, -9% in the experimenter-set goal phase, and -68% in the choice phase. The PDP for participant 1 was 47% in the participant-set goal phase, 7% in the experimenter set goal phase, and 15% in the choice phase. The PDP for participant 2 was 11% in the participant-set goal phase, 0% in the experimenter-set goal phase, and 10% in the choice phase. The PDP for participant 3 was 47% in the participant-set goal phase, -38% in the experimenter-set goal phase, and -65% in the choice phase. Finally, the calculation of non-overlapping data for participant 1 was 55% in the participant-set goal phase, 5% in the experimenter-set goal phase, and 7% in the choice phase. For participant 2, the PND was calculated at 0% for the participant-set goal phase, 3% for the experimenter-set goal phase), and 11% for the choice phase. For participant 3, the PND was calculated at 98% in the participant-set goal phase, 0% in the experimenter-set goal phase, and 0% in the choice phase.

Figure 3 shows that Fitbit active minutes, which Fitbit defines as 10 min or more of moderate-to-vigorous physical activity, create a similar pattern to steps per day when displayed on the multiple-baseline graph. We also calculated a Pearson product-moment correlation coefficient across all participants to quantify any possible association between steps per day and Fitbit's active minutes. Data from all three participants suggest a large positive correlation between steps and active minutes (P1: r (105) = 0.7664, p < .001; P2: r (98) = 0.8441, p < .001; P3: r (93) = 0.8638, p < .001). Figure 4 illustrates these individual data, with clear clustering around the line of best fit (95% confidence), suggesting that steps per day are highly correlated
with Fitbit’s active minutes, which suggests that most of our participants’ steps were taken at a rate of 100 steps per min. All participants chose to continue the experiment for 1-2 weeks beyond the previously agreed upon 14-week intervention length, which served as a direct measure of social validity.

**Figure 3.** The graph depicts active minutes per day using a multiple-baseline across participants design. The filled circles represent each participant’s active minutes per day and the solid lines represent a seven-day simple moving average.
Figure 4. The following graphs depict the calculated Pearson correlation coefficients for steps per day versus active minutes per day.
Our interpretation of the participants' choice to continue with the health coaching intervention after completing their previous verbal commitment, is that it is an indication of the plausibility of one using a similar intervention outside of an experimental setting. For the quantitative portion of the social validity questionnaire, participants scored the health coaching process 93 out of a total of 105 possible point (Figure 5).

*Figure 5.* The graph depicts the results from the quantitative portion of the social validity questionnaire. A score of 5 indicates that the participant strongly agrees with the statement, while a score of 1 indicates strong disagreement. Questions 1-4 are positively scored and questions 5-7, noted with an asterisk, are negatively scored.
Participant 1 scored one question as neutral and the remaining positively and negatively framed questions as agree or disagree, respectively. Participant 2 scored two positively framed questions as agree, two as strongly agree, and all negatively framed questions as strongly disagree. Participant 3 scored all positively and negatively framed questions as strongly agree and strongly disagree, respectively. Based on all Participants' answers, these scores suggest a

Table 2

<table>
<thead>
<tr>
<th>Qualitative information</th>
<th>Participant 1</th>
<th>Participant 2</th>
<th>Participant 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do you feel when you reach a goal?</td>
<td>It always feels good to reach my goals.</td>
<td>Kind of indifferent.</td>
<td>It feels good because my time is limited.</td>
</tr>
<tr>
<td>How do you feel when you don’t reach a goal?</td>
<td>Disappointed; it’s awkward.</td>
<td>When I haven’t met my goal – I feel bad.</td>
<td>It bothers me when I don’t reach a goal. When I say I’m going to do something I really want to do it.</td>
</tr>
<tr>
<td>What was the most common barrier that you faced throughout the process?</td>
<td>Scheduling a specific time to walk.</td>
<td>Work and school (scheduling).</td>
<td>Time (not enough).</td>
</tr>
<tr>
<td>What strategies worked best for you?</td>
<td>Walking first thing in the morning.</td>
<td>Starting the day with my steps; when I do, I’m more conscious of my health.</td>
<td>Making sure I had enough time so that I wasn’t overwhelmed (time management).</td>
</tr>
<tr>
<td>What helped the most overall?</td>
<td>Just getting it over with so I could meet the goal.</td>
<td>Having specific activities planned (hiking).</td>
<td>Being able to go to the gym, or the park when it wasn’t hot outside.</td>
</tr>
<tr>
<td>Was there any portion of the experience that you would like to change? If so, what?</td>
<td>Nothing.</td>
<td>As the study went on, I forgot that I was participating in it. A mid-week check in might have motivated me to walk more.</td>
<td>It would have been easier if the Fitbit recorded all physical activity (as opposed to just walking).</td>
</tr>
</tbody>
</table>
high degree of social validity. All participants returned their social validity surveys via email the same day they were sent, following their final session. The final open-ended questions of the social validity questionnaire, including statements regarding goal-setting preference, can be found, along with participant responses, in Table 2.
CHAPTER 4: DISCUSSION

Over 3 months, we used telehealth to engage three participants in a package intervention to increase their physical activity. We tracked their steps each day using remote monitoring while investigating two goal-setting strategies in a series: participant-set and experimenter-set. During weekly meetings, we provided instruction on practical goal-setting and problem-solving while motivating participants to make healthier choices related to exercise. We engaged participants in a health coaching intervention in tandem with evidence-based procedures in self-monitoring, goal-setting using a percentile schedule, and feedback. In behavior analytic studies that used goal-setting and feedback procedures (Kurti & Dallery, 2013; Zarate et al., 2019), participants’ steps increased following the implementation of goal-setting. Likewise, for our study, participant steps per day increased once they set a goal, as we noted improvements amounting to 68% to 98% increases in step counts following the self-monitoring phase. It should be noted that although Participant 2 did not reliably increase her weekly step count averages, her strategy was to increase her step count during scheduled hikes, which she did during the Choice phase, as displayed in Figure 1. This improvement may be seen as important when considering the client-led approach of health coaching. However, our purpose was to specifically investigate two goal-setting strategies and based on these data, beyond goal setting, it is unclear what factors contributed to the changes in behavior as there was no clear differentiation across goal-setting phases.

Many of the differences between the behavior analytic research and our approach were related to our goal of approximating typical health coaching practices, with the most notable of these practices being the use of self-set goals. We also used weekly telehealth meetings in which
barriers to physical activity were discussed, along with relevant strategies for overcoming them. However, we did not isolate these conditions across phases, so we cannot speak to the strength of “problem-solving”. A key difference between our study and Kurti and Dallery (2013) was that the intervention involved daily communication via video submission and text message, rather than the weekly communication used in both the present study and Zarate et al. (2019). Providing praise upon meeting a weekly step goal might have increased day-to-day variability for some participants, in contrast with the results seen from daily goals (Kurti & Dallery, 2013). As participant 2 stated, “I like thinking in terms of a weekly goal because if I don’t walk for several days, I can still make it up at the end of the week.” Such a strategy may result in variable responding when used in practice. Future researchers should investigate any potential differences in behavior that may arise from schedule effects.

**Methodological Considerations**

We must also consider the methodological features of the design and any potential impact on outcomes. Being that experimenter-set goals followed self-set goals, if a participant who previously set their own goals failed to contact reinforcement, there would be a history of extinction (Lattal et al., 2013) to overcome once the experimenter began to set the goals. This history is an essential consideration for health coaches because, by the time a client walks into their office, they may have a long learning history wherein they began to engage in healthier behavior but stopped before contacting reinforcement. Furthermore, participants may have experienced a history of reinforcement related to being overly sedentary during self-set goals (e.g., watching television rather than exercising or eating snack foods rather than cooking). In practice, the job of the health coach would then be to provide a more recent learning history of reinforcement for physical activity, so as to overcome the previous histories.
During health coaching sessions, two participants specifically stated that they thought that praise following an achieved goal had little effect on achieving goals in the future, and all participants reported that failure to meet a set goal was unpleasant, with one participant stating that it felt "awkward." This may suggest that negative reinforcement was a more potent consequence than the intended positive reinforcement in the form of praise. However, it is worth noting that not only did all participants give health coaching high scores on the social validity questionnaire, but they also chose to participate in additional sessions beyond their initial commitment. This choice, coupled with the relatively modest increase in physical activity for all participants, may suggest that there may be reinforcing aspects of the health coaching sessions that do not necessarily translate to a change in health-related behavior. After all, there is evidence that suggests health coaching may increase attendance in health and wellness programs (Michaelides et al., 2016; Young et al., 2015).

Although participants attended 100% of their health coaching sessions, we were unable to identify a functional relationship between our intervention strategies and participants steps per day. There is a need for practical strategies that address the real-world barriers that our participants discussed, such as deaths in the family, challenging schedules, moving long distances, and extreme weather, as these are typical human experiences. For example, all participants discussed scheduling or time management as the number one barrier to reaching their physical activity goals. Future researchers may want to investigate training participants to use a daily schedule and other self-management techniques. Following the experiment, Participant 3 stated that more frequent contact might have resulted in better goal adherence because, despite wearing a Fitbit daily, she “forgot” that she was supposed to be walking (Table 2). Experimental designs that rely on more frequent contacts support this anecdotal report
(Lombard et al., 1995; Pinto et al., 2015), as more frequent contacts seem to be associated with larger outcomes. Health coaches may want to adopt this model, as opposed to the weekly contacts we see in much of the health coaching research (Wolever et al., 2013).

**Limitations and Suggestions for Future Research**

Although we directly measured the participants’ steps per day for over three months, engaging in physical activity is a long-term objective, and this period is just a snapshot of a lifetime. For example, although 2 out of 3 participants increased their steps per day during the study, if we had stopped the study around May 21st, it would create the illusion of a dramatic effect from the changing criterion. Even for the two participants who did increase their baseline steps, we do not know if this experience will have any lasting effect. Future researchers should consider long-term follow-up studies which would benefit the body of research by seeing if any substantial changes are maintained over time.

Another limitation is the strict mode of exercise in steps per day. Participants reported difficulty with their walking/running routine due to changes in the weather, thus all three participants reported engaging in physical activity aside from walking or running, which we could not track. Participant 1 reported lifting weights, participant 2 reported using exercise videos, and participant 3 began swimming exclusively when the summer temperatures became too high to walk outside safely. Future researchers could expand the number of exercise modalities, using newer technology to measure performance directly.

Lastly, praise was the only contrived consequence delivered throughout the study, which may not have been potent relative to the consequences for behavior that was alternative to or incompatible with physical activity. Future research should examine other strategies such as Contingency Management (CM). CM is an evidence-based practice (Petry, 2000) used in
applied behavior analysis. Essentially, CM interventions incentivize behavior change via the differential reinforcement of a directly measurable target behavior, in which a participant receives some desired consequence for engaging in that behavior (Kurti & Dallery, 2013). Behavior analysts have demonstrated the effectiveness of monetary incentive programs to increase physical activity across a wide variety of populations, settings, and delivery methods (e.g., Bernard et al., 2008; Kurti & Dallery, 2013; Patel et al., 2019) and future researchers investigating the effectiveness of health coaching should consider similar strategies. In this case, the challenge for researchers would be to determine how goals would be set while providing monetary incentives. Although the experimenter-set goal phase would be straightforward, participants may set unchallenging goals to access their reward more easily when given the opportunity. For CM to work in the context of self-set goals, researchers would have to develop strategies that address this possibility.

Although the data from this intervention do not provide straightforward suggestions as to its effectiveness, future researchers can benefit from the information discussed above. Although the results of this study are ambiguous, visual analysis can be a stringent method of analysis and may not detect weak but reliable effects (Kazdin, 2011). For example, this study does support the findings of previous changing criterion designs (Kurti & Dallery, 2013; Normand, 2008; Zarate et al., 2019), as once participants began setting goals, steps per day increased. The suggestions for future researchers mentioned previously may help develop similar interventions such that more substantial effects may be produced (Kazdin, 2011). This intervention may not have been identical to a real-world health coaching practice; however, we attempted to approximate the health coaching experience while systematically changing tactics to investigate the effect on behavior. Although we failed to demonstrate a functional relation, participants did
increase their physical activity, but we cannot be sure why. This work is still important, as we investigated health coaching using valid and reliable measures, and our required demonstration of experimental control sets a high bar for evidence. Future researchers can use the findings of this study as a starting point in their research to improve the outcome of health and wellness coaching and thereby inform integrated health care practice.

Lastly, we cannot ignore that this study was conducted during the worldwide Covid-19 pandemic. We cannot be sure how this affected participant's behavior, although we have some qualitative reports from participants who discussed deviations from their typical walking opportunities. For example, as all participants were college students and classes were conducted online, students spent more time at home and less time walking on campus. Additionally, public spaces such as grocery stores and malls limited the number of occupants allowed inside, and participants were less likely to utilize these spaces, which are commonly used for walking. Lastly, gyms and public parks were closed for an extended period during the beginning of the pandemic. The results of the previously mentioned effects of the Covid-19 pandemic were that participants reported that their opportunities to walk and run were often limited to city streets and sidewalks. As previously mentioned, other exercises were used to compensate for these factors, but were not tracked. External events are always present during an experiment; however, it should be noted that this was a significant historical event, and these effects may not be typical across time and setting.
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https://doi.org/10.1016/j.eurpsy.2018.07.004


Do you want to increase your level of physical activity but are unsure how? You may be eligible for a 16-week study that could improve your level of physical fitness.

You may qualify if you:
- Are between the ages of 18 and 55
- Have not recently been told by a doctor that you should refrain from exercise
- Have reliable internet access
- Have computer or smart phone access

Participation includes:
- 1 60-minute internet session
- 16 weekly internet sessions
- The use of a device (Fitbit, computer, or smartphone) to measure physical activity

Potential benefits
- 4 months of free health and wellness coaching

Location: On-line

For more information
Please contact Logan Gibson at (209) 222-8971 or email j_gibson4@u.pacific.edu
APPENDIX B: CHANGE IN ACTIVITY LEVEL READINESS QUIZ

Are you ready to increase your physical activity? Your attitude about making a change affects your ability to succeed. Mark each item true or false. It’s important that these answers reflect the way you really are, not how you would like to be.

1. ______ I have thought a lot about my physical activity habits to pinpoint what I need to change.
2. ______ I have accepted the idea that I need to make permanent, not temporary, changes in my eating habits.
3. ______ I will only be successful if I greatly increase my physical activity.
4. ______ I accept that it’s best if I increase my activity level slowly.
5. ______ I’m thinking of becoming more active now because I really want to, not because someone else thinks I should.
6. ______ I think becoming more active will solve other problems in my life.
7. ______ I am willing and able to increase my regular physical activity.
8. ______ I can increase my activity level successfully if I have no “slip-ups.”
9. ______ I am ready to commit some time and effort each week to organizing and planning my activity progress.
10. ______ Once I see some progress, I usually lose my motivation to keep going until I reach my goal.
11. ______ I want to start a physical activity program, even though my life is unusually stressful right now.

Note: The weight loss readiness was developed by the Academy of Nutrition and Dietetics and is based on the transtheoretical model of behavior change. This is a modified version, made to address readiness to begin a physical activity program, specifically.
Change in Activity Level Readiness Quiz Scoring

1. To score the quiz, look at your answers to items 1, 2, 4, 5, 7, 9. Score “1” if you answered “true” and “0” if you answered “false.”

2. For items 3, 6, 8, 10, 11, score “0” for each true answer and “1” for each false answer.

3. To get your total score, add the scores for all. If you scored 8 or higher, you probably have good reasons for wanting to change your activity level now and a good understanding of the steps needed to succeed.

Note: The weight loss readiness was developed by the Academy of Nutrition and Dietetics and is based on the transtheoretical model of behavior change. This is a modified version, made to address readiness to begin a physical activity program, specifically.
APPENDIX C: PHYSICAL ACTIVITY READINESS QUESTIONNAIRE

NAME __________________________________________

DATE OF BIRTH _________________________ AGE: ________________

To be completed by the participant.

Has the test procedure(s) that you will participate in been fully explained to you?

Please tick appropriate box

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>

Any information contained herein will be treated as confidential

1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?

2. Do you ever experience chest pain during physical activity?

3. Do you ever lose balance because of dizziness or do you ever lose consciousness?

4. Do you have a bone or joint problem that could be made worse by a change in your physical activity participation?

5. Do you have uncontrolled asthma (i.e. asthma that is not easily controlled by an inhaler?)

6. Is your doctor currently prescribing any medication for your blood pressure or a heart condition?

7. Do you know of any other reasons why you should not undergo physical activity? This might include diabetes, a recent injury, or serious illness.

If you have answered NO to all questions then you can be reasonably sure that you can take part in the physical activity requirement of this project.

I ____________________________ declare that the above information is correct at the time of completing this questionnaire on date _____/_____/______

Please note: If your changes so that you can answer YES to any of the above questions, notify the investigators and consult with your doctor regarding the level of physical activity that you can participate in.
If you answered YES to one or more questions:

Talk to your doctor in person discussing with him/her those questions you answered yes.

Ask your doctor if you are able to participate in the physical activity requirements of the project.

Doctor’s Name_______________________________ Date ________/________/________

Doctor’s Signature ____________________________________

___________________________________________________________________________

Signature of Investigator _______________________________ Date
________/_________/__________

_______/________/________
APPENDIX D: DEMOGRAPHICS QUESTIONNAIRE

1. What is your age?
   a. Under 18
   b. 18-24
   c. 25-34
   d. 35-44
   e. 45-54
   f. Above 54

2. What would best describe you?
   a. African American
   b. Asian
   c. Native American
   d. White
   e. Other

3. Are you of Spanish or Latino origin?
   a. Yes
   b. No

4. Which gender do you identify most with?
   a. Male
   b. Female
   c. Other
   d. I would prefer to not comment

5. What is your highest qualification?
   a. Less than high school diploma
   b. High school diploma or equivalent degree
   c. No degree
   d. Bachelor’s degree
   e. Master’s degree
   f. Doctorate
6. What is your marital status?
   a. Married
   b. Divorced
   c. Separated
   d. Widowed
   e. Unmarried

7. What is your current employment status?
   a. Full-time employment
   b. Part-time employment
   c. Unemployed
   d. Self-employed
   e. Home-maker
   f. Student
   g. Retired

8. Which income group does your household fall under?
   a. Less than $20,000
   b. $21,000 – $30,000
   c. $31,000 to $40,000
   d. $41,000 to $50,000
   e. $51,000 to $60,000
   f. Above $60,000
Title of Project: Evaluating the effects of client-set versus coach-set goals in the context of a health-coaching intervention for physical activity

My name is J. Logan Gibson, and I am a graduate student in the Department of Psychology at the University of the Pacific. You are invited to participate in a research study which will examine the effects of a behavioral treatment on the physical activity level of adults. Physical activity will be measured as the number of steps you take. We will use a wearable fitness tracker that records the number of steps you take each day.

If you decide to participate, you will be asked to 1) wear the fitness tracker each day for a period of 13-17 weeks, 2) meet with a health coach on a weekly basis, 3) take measurements (e.g., weight, blood pressure, blood glucose level) in the presence of the health coach, if relevant, and 4) complete a number of questionnaires. No identifying information (e.g., name, location) will be shared.

You will be required to spend a total of approximately 13 weeks involved in the study, although most of the time spent will not require you to make any special changes in your daily routine. It is expected that the information gained from this study will provide important information about the behavioral changes resulting from the intervention. This information will aid in the development of better interventions to improve the health and fitness of adults.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission, the information will be used for research purposes only.

Your participation is entirely voluntary and your decision whether or not to participate will involve no penalty. If you decide to participate, you are free to discontinue participation at any time without penalty.

If you have any questions about the research at any time, please call J. Logan Gibson at 281-908-1801. If you have any questions about your rights as a participant in a research project please call the office of Research and Graduate Studies, University of the Pacific, Stockton, CA 95211. The Graduate School telephone number is: (209) 946-7367. In the event of a research related injury, please contact your usual medical provider. You will be offered a copy of this form to keep.

Your signature below indicates that you have read and understand the information provided above, that you willingly agree to participate, that you may withdraw your consent at any time and discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled, that you will receive a copy of this form, and that you are not waiving any legal claims, rights or remedies.
Print Name________________________________________

Signature __________________________________________      Date ____________________
APPENDIX F: INITIAL HEALTH COACHING SESSION AGENDA

1. Introduction
   a. E.g. Exchange names and pleasantries.

2. Summarize what a health coach is/does.
   a. E.g. “I’m here to help you meet your health goals.”

3. Behavioral outline (Appendix H)

4. Motivational Interview for Improving Health (Appendix J)

5. Provide exercise recommendations (U.S. Dept. HHS, 2018)
   a. E.g. “The current recommendations is at least 10,000 steps per day.”

6. Discuss non-physical activity related goals
   a. E.g. “I’d like to sleep better at night.”
      i. Provide educational materials (Appendix G)

7. Prompt participant to set goal for the week
   a. Teach S.M.A.R.T. goal setting

8. Review measurement of DV

9. Schedule next session along with delivery of primary DV measure
APPENDIX G: ADDITIONAL HEALTH RECOMMENDATIONS

Smoking Cessation:

https://www.cdc.gov/tobacco/quit_smoking/how_to_quit/index.html

Diet:

https://www.cdc.gov/nutrition/index.html


Stress Reduction:

https://www.cdc.gov/violenceprevention/suicide/copingwith-stresstips.html


Improved Sleep:

https://www.cdc.gov/sleep/index.html

https://www.fda.gov/consumers/free-publications-women/sleep-problems

Exercise:

https://www.cdc.gov/physicalactivity/index.html
Motivational Interview for Improving Health

- I want to ask you a strange question: What if when you were sleeping, a miracle happened, and the problems that interfere with getting healthier have disappeared. Since you were sleeping, you didn’t know that the miracle happened. When you woke up, how would you know that it happened?

  - What in your life would be different?

- What would your life look like?

  - What would you eat for breakfast, lunch, dinner?

  - How often would you exercise?

  - Would you smoke? Drink alcohol?

  - How many hours would you sleep at night? How stressed would you feel?

- Are there already times that feel like the miracle happened- even a little bit?
• Was there a time you felt healthy? What was it like? What was different about that time?

• What did you do during that time to make yourself healthy?

• What would you have to do to get you back to this time?

• On a scale from 1 to 10, with 1 being the worst it has ever been, and 10 being the best things could be, where would you rate things today?
  
  o Why?

  o What would a 10 look like?
<table>
<thead>
<tr>
<th>Positives of Staying the Same</th>
<th>Negatives of Staying the Same</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Positives of Changing</td>
<td>Negatives of Changing</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# APPENDIX I: BEHAVIORAL OUTLINE

## Target Behavior

<table>
<thead>
<tr>
<th>Current Daily Behaviors</th>
<th>Excess</th>
<th>Deficits</th>
</tr>
</thead>
</table>

## Barriers to Behavior Change

## Motivation to Exercise

## Client Preferences for Exercise | Past Experiences with Exercise

## Educational Materials Provided

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Sleep</th>
<th>Smoking</th>
<th>Diet</th>
<th>Stress Reduction</th>
<th>Drugs/alcohol</th>
</tr>
</thead>
</table>

## Terminal Behavior
1. Determine if established goal has been met
   a. Provide praise contingent on meeting of goal
2. Discuss barriers to meeting goal
   a. E.g. “I am very busy with work.”
   b. E.g. “I always forget to exercise.”
3. Discuss solutions
   a. E.g. “How could you schedule in some physical activity? Perhaps a walk after
dinner would work for you.”
   b. E.g. “Have you ever tried setting an alarm?”
4. Measure secondary DV if applicable
   a. E.g. The client can use their home blood glucose reader and hold the display up
   the camera for the health coach to view.
5. Schedule next session along with delivery of primary DV measure
### APPENDIX K: CONTINGENT FEEDBACK SAMPLE

<table>
<thead>
<tr>
<th>Met Goal</th>
<th>Failed to Meet Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>You reached your goal of (exercise goal). Great job! I knew you could do it!</td>
<td>You didn’t reach your goal this week of (exercise goal). Let’s dig deep and try harder this week.</td>
</tr>
<tr>
<td>It looks like you reached your exercise goal this week. That’s awesome! How does it feel?</td>
<td>Your goal this week was (exercise goal) and you reached (realized goal). Let’s see if we can overcome some barriers this week.</td>
</tr>
<tr>
<td>Your goal for this week was (exercise goal) and you hit (realized goal). That’s amazing! You really worked hard and it shows!</td>
<td>Your goal this week was (exercise goal) and you hit (realized goal). Let’s reflect on this week and see what we need to work on.</td>
</tr>
<tr>
<td>Your goal was (exercise goal) and you hit (realized goal). You’re doing so well. Keep up the good work!</td>
<td>You hit (realized goal), but your goal this week was (exercise goal). How can we get these numbers up to hit your goals?</td>
</tr>
<tr>
<td>You knocked it out of the park this week. Your goal was (exercise goal) and you hit (realized goal). Fantastic effort!</td>
<td>You fell short of your goal of (exercise goal) with a number of (realized goal). What can we do to make sure that doesn’t happen next week?</td>
</tr>
<tr>
<td>Your goal was (exercise goal) and you reached (realized goal). Very impressive. How did you manage it?</td>
<td>Your goal was (exercise goal), however you only achieved (realized goal). I know you can do it; this week is your week.</td>
</tr>
</tbody>
</table>
### APPENDIX L: PERCENTILE SCHEDULE SAMPLE

<table>
<thead>
<tr>
<th>Steps</th>
<th>n=no r+</th>
<th>y=r+</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Week 9</strong></td>
<td>1000 r1</td>
<td></td>
</tr>
<tr>
<td><strong>Week 10</strong></td>
<td>2000 r4, 2000 r4</td>
<td></td>
</tr>
<tr>
<td><strong>Week 11</strong></td>
<td>1500 r3, 1500 r3, 1500 r3</td>
<td></td>
</tr>
<tr>
<td><strong>Week 12</strong></td>
<td>1250 r2, 1250 r1, 1250 r1, 1250 r1</td>
<td></td>
</tr>
<tr>
<td><strong>Week 13</strong></td>
<td>1400 n r2, 1400 r2, 1400 r2, 1400 r1</td>
<td></td>
</tr>
<tr>
<td><strong>Week 14</strong></td>
<td>1600 y r4, 1600 r3, 1600 r3, 1600</td>
<td></td>
</tr>
<tr>
<td><strong>Week 15</strong> (CM)</td>
<td>1650 y r4, 1650 r4, 1650</td>
<td></td>
</tr>
<tr>
<td><strong>Week 16</strong> (CM)</td>
<td></td>
<td>1500 n r2, 1500</td>
</tr>
<tr>
<td><strong>Week 17</strong> (CM)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Initial session will begin with simplified overview of percentile schedule

2. Determine if goal has been met
   a. Provide praise contingent on meeting of goal (Appendix H)

3. Discuss barriers to meeting goal

4. Discuss solutions

5. Measure secondary DV if applicable

6. Schedule next session along with delivery of primary DV measure
APPENDIX N: TREATMENT ACCEPTABILITY QUESTIONNAIRE

Initial Health Coaching Session

<table>
<thead>
<tr>
<th>Questionnaire Items</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Representation</strong></td>
<td>1 (Strongly Disagree), 4 (Neutral), 7 (Strongly Agree)</td>
</tr>
<tr>
<td>I found the procedures used in the health coaching session to be an acceptable way to relay important information</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>I believe the health coach asked an appropriate number of open-ended questions</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>I believe the health coach used reflective listening as one typically would in a session</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>I believe the health coach’s summaries looked like what I would expect from a typical session</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>I believe feedback was delivered as it would in a typical health coaching session</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td><strong>B. Technical quality</strong></td>
<td>1 (Low quality) 4 (Neutral) 7 (High quality)</td>
</tr>
<tr>
<td>I would rate the health coach’s ability to deliver a motivational interview as</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>I would rate the health coach’s ability to summarize the participant’s statements as</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>I would rate the health coach’s ability to explain S.M.A.R.T. goal setting as</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>The quality of the health coach’s feedback was</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>
### Weekly Session

<table>
<thead>
<tr>
<th>Questionnaire Items</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Representation</strong></td>
<td>1 (Strongly Disagree), 4 (Neutral), 7 (Strongly Agree)</td>
</tr>
<tr>
<td>I found the procedures used in the health coaching session to be an acceptable way to relay important information</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>I believe the health coach asked an appropriate number of open-ended questions</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>I believe the health coach used reflective listening as one typically would in a session</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>The health coach’s use of S.M.A.R.T. goal setting was representative of the way it is used in health coaching practice</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>I believe the health coach’s summaries looked like what I would expect from a typical session</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>I believe feedback was delivered as it would in a typical health coaching session</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td><strong>B. Technical quality</strong></td>
<td>1 (Low quality) 4 (Neutral) 7 (High quality)</td>
</tr>
<tr>
<td>I would rate the health coach’s ability to deliver a motivational interview as</td>
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<tr>
<td>I would rate the health coach’s ability to summarize the participant’s statements as</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>The quality of the health coach’s feedback was</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>
### Social Validity Survey

**1. Would you like to continue in the study for an additional 4 weeks?**

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree Nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**2. The exercise protocol was too challenging.**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

**3. The experience was worth the time spent.**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

**4. The health-coaching sessions helped me achieve my goals.**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

**5. The use of a smartphone/computer made the process more difficult.**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

**6. The preset goals were helpful in increasing my physical activity.**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

**7. I would not recommend health-coaching to a close family member.**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

**8. I am happy with the overall experience.**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>
9. Was there any portion of the experience you would like to change? If so, what change(s) do you recommend?