RESEARCH CONSENT FORM

The Adaption of the GameSquad Exergaming Intervention for Young Adults with Down Syndrome: A Pilot Feasibility Study. (Phase 2)

Investigator: Lauren Ptomey, PhD
University of Kansas Medical Center
3901 Rainbow Blvd
Kansas City, KS 66160
913-588-7938

- We are asking you to be in a research study.
- Research is done to answer a scientific question. Research studies may or may not help the people who participate.
- Joining this study is completely voluntary. If you say yes, you can quit the study at any time.
- You can still get medical care and other services from the University of Kansas Medical Center even if you are not in the study.
- The research team will explain what happens if you decide to join the study. This conversation is called "informed consent."
- Informed consent includes a chance to get your questions answered before you make your decision. Please ask as many questions as you need to.
- This consent form explains the study. Take as much time as you need to decide.
- If you decide to be in the study, you will be asked to sign this form.

You are being invited to join a research study. Dr. Ptomey is conducting the study at the University of Kansas Medical Center (KUMC). About 20 people will be in phase 2. Here are basic things for you to think about:

- You can decide if you want to be in the study or not.
- Please take as much time as you need to make your choice.
- You can ask questions at any time.
- Even if you say yes now, you can still leave the study at any time. Leaving will not affect your regular care.

Why is the study being done?
Down syndrome (DS) is the most common chromosomal abnormality associated with an intellectual disability. There is currently considerable interest in increasing physical activity among adults with disabilities. The goal of this study is to see if video game based physical activity is beneficial and feasible for people with DS.

How long with the study take?
We expect your participation to last about 14 weeks and involve 2 visits to the research clinic and 12 at home workouts for 90-180 minutes each, depending on what week of the study you are in. You do not have to do all of your weekly exercise minutes in one day. You will also have 12 at-home, virtual coaching sessions for 30 minutes each.

What will happen if I join the study?
We will give you a form for your doctor to sign, giving permission for you to be in the study. You will need your doctor's permission before you begin.

Week 0 (At KUMC):
You will come to the research clinic and fill out a demographic questionnaire. The research team will give you a Nintendo Switch™ along with the Ring-Fit Adventure™ video game. The Nintendo Switch™ is a video gaming console that will be used within your home during this study. It will be required to be hooked up to a television so that you can play an active video game, Ring-Fit Adventure™. The research team will show you how to use the game by creating a profile and going through two, unique "levels" within the game. This will take about 45 minutes.

You will take both Ring-Fit Adventure™ and the Nintendo Switch™ home with you. We will ask you to use the game for 60 minutes (1 hour) per week. You can go at your own pace during these sessions.

The research team will also give you a Fitbit Versa 3 and an iPad. You will be asked to wear the Fitbit on your wrist while you play the video game. A Fitbit is a device that is similar to a wristwatch and measures how much movement and activity occurs when you are wearing it. The information from your watch will automatically be sent to an application on your iPad. The study team will give you guidance on how to use the Fitbit and iPad.

You will also be asked to do these physical activity tests:

6-minute walk: This test measures the distance that you can walk on a flat, hard surface in a period of 6 minutes. The research team will instruct you on how to prepare and conduct this test.

Timed Up and Go: During this test, you will be asked to sit down in a chair. Approximately 10 feet in front of you there will be a line on the floor. The research team will say "go" and you will get up from the chair, walk to the line at your normal pace, and then turnaround and walk back to the chair and sit down again. The research team will record how long it takes you to do this.

Balance: During this test, we will ask you to balance on one leg and reach in three directions as far as you can with your other foot. You will then do the same on your other leg.

Leg Strength: Leg strength will be measured on the leg press machine. Researchers will assess the maximum amount of weight you can press for 5 repetitions.

Hand Grip Strength: You will be asked to squeeze a device as hard as you can to test your grip strength. This will be done on both hands.

Researchers will also ask you and your parent/caregiver questions about how much you enjoy physical activity, and what you currently do for exercise.

<u>Weeks 1-12 (At Home)</u>:
We will ask you to play Ring-Fit Adventure™ for 90-180 minutes per week. While playing Ring-Fit Adventure™, you will be asked to do a variety of exercises and activities. These include jogging in place with a leg strap attached to your leg, pressing and pulling a ring that is similar to a Pilates ring, leg/abdominal/yoga exercises.

Weekly exercise minutes:

- Week 1: 90 minutes
- Week 2: 120 minutes
- Week 3: 150 minutes
- Week 4-12: 180 minutes (each week)

You and your parent/caregiver will also be asked to do a weekly coaching session with the research team, which will take about 30 minutes per week. You will not need to come to the clinic for your coaching sessions, as they will be done over your iPad using Zoom. During these sessions, the research team will:

- review the study requirements with you
- review your physical activity over the past week.
- give you information on the importance of engaging in physical activity
- ask if you have had any problems with using the game or system
- provide social support and encouragement.

<u>Week 13 (At KUMC)</u>:
During this visit, the researchers will also ask you and your parent/caregiver questions about how much you enjoy physical activity, if you were able to complete all of your exercise sessions and return your IPad to the researchers. You will also perform the same physical activity tests and optional exercise test you did during your Week 0 study visit.

What are some risks of joining the study?
You may have problems because of the procedures that will be performed during the study. These are called adverse events or side effects. Some may be only an inconvenience, but some may be harmful. There could be side effects that are not yet known or the research may involve

risks to you that are currently unforeseeable. It is important that you tell the study team immediately about any side effects or problems you have.

Exercise/Physical Activity: You might have muscle soreness, fatigue, nausea, dizziness. There is a very rare chance of unpredictable changes in blood pressure or heart rhythm, and heart attack.

Questionnaires: You might feel uncomfortable answering some of the questions in the questionnaire. You may skip a question or stop participating altogether.

Computer Security: There is a chance that someone outside the study could get information from the computers when they are not supposed to have it. After your information comes to the research team, it will be stored on secure computers.

Are there benefits to being in this study?
Being in this study could help you find another method of exercise you enjoy. This may prove useful for future exercise behavior. The researchers might learn how to motivate adults with Down syndrome to exercise.

Will it cost anything to be in the study?
You will not be charged for being in the study. The costs of the iPad, Nintendo Switch™ and the Ring-Fit Adventure™ video game will be covered by the study. We ask that you return the iPad at the conclusion of the study.

Will I be paid for being in the study?
If you complete all 14 weeks of the study, you will be allowed to keep the Fitbit, Ring-Fit Adventure™ and the Nintendo Switch™. These devices retail at $540. If you cannot complete all 6 weeks of the study, we will ask that you return all equipment. In the event of possible damages to any of the devices, we will provide you with a replacement.

What are the financial arrangements for this study?
The institution (KUMC Research Institute, Inc.) will receive payments from the sponsor, Healthy Weight Research Network for Children and the Center for Children's Healthy Lifestyles and Nutrition for conducting this study. Payments will be used for research purposes only.

What happens if I get hurt or sick during the study?
If you get hurt or sick during the study, please talk to someone on the research team by calling 785-813-5951 or 337-396-8980 (24 hours). They might tell you to see a doctor. If you have a physical injury as a result of participating in this study, treatment will be provided for you at the usual charge. Treatment may include first aid, emergency care and follow-up care, as needed. Claims will be submitted to your health insurance policy, your government program, or other third party. You will be billed for the costs that are not covered by the insurance. You do not give up any legal rights by signing this form.

What other choices do I have?

You can choose not to be in this study. You can talk to your doctor about different physical activity programs you can participate in if you decide not to be in this study.

How will my information be protected?
The researchers will keep your identity confidential, as required by law. Absolute confidentiality cannot be guaranteed because persons outside the study team may need to look at your study records. The researchers may publish the results of the study. If they do, they will only discuss group results. Your name will not be used in any publication or presentation about the study.

Your study information will be labeled with your research ID number. The study team will keep a separate list that matches your name to the research ID number. These steps will lessen the risk that your personal identity and information will be seen by others who shouldn't have it.

If you sign this form, the research team will collect, use and share your private health information as described below. If you decide not to sign this form, you cannot be in the research study.

Study data includes information from your study activities. The team may use any and all of your information needed for the study. Others at KUMC might need to look at your research records. They include KUMC Research Institute, the Institutional Review Board or other committees and offices that review and monitor research studies.

You may not be able to see your records relating to the study until after the study is over and the results are known.

The research team will share your study data with people outside KUMC. These groups or agencies may make copies of study data for audit purposes. If your information is disclosed by your health care providers or the research team to others, federal and state confidentiality laws may not protect it. These groups may include:

- Federal agencies that oversee human research (if a study audit is performed)
- Healthy Weight Research Network
- Center for Children's Healthy Lifestyles & Nutrition
- Experts who inspect the study information to see if the study is being done correctly and if it is still safe to continue
- Other groups that help manage or provide services to support the study

Your permission to use and share your health information will not expire unless you cancel it. To cancel your permission, please write to Dr. Ptomey. The mailing address is Lauren Ptomey, PhD, University of Kansas Medical Center, 3901 Rainbow Boulevard, Kansas City, KS 66160. If you cancel your permission, you will be withdrawn from the study. The researchers will stop collecting any additional information about you about you unless they need information about a side effect. They are permitted to use and share information that was gathered before they received your cancellation.

The researchers may publish the results of the study. If they do, they will only discuss group results. Your name will not be used in any publication or presentation about the study.

Will I be told about research results?
You will be told how much you played Ring-Fit Adventure™ in total as well as how many calories you burned during the exercise test if you decide to do it. You will also be provided the overall results from the study by the study team.

What if I decide to leave the study?
You can decide to leave the study at any time. Leaving will not affect the treatment or services you get at KUMC. We will tell you any new information that might affect whether or not you want to be in the study. If you want to cancel your permission to use your study information, please send a letter to Dr. Ptomey at the address shown below. If you cancel permission to use your information, we will stop collecting information about you. We are allowed to use and share information that was collected before we received your cancellation. We might decide to stop the study. We could stop your being in the study if it wasn't safe for you or if you didn't follow the study rules.

QUESTIONS ABOUT THE STUDY
If you have any questions about the study, you can call or write to Dr. Ptomey:

Lauren Ptomey, PhD,
University of Kansas Medical Center
3901 Rainbow Blvd
Kansas City, KS 66160
913-588-7938

If you have questions about your rights as a research participant, or if you want to talk with someone who is not involved in the study, you may call the KUMC Institutional Review Board at (913) 588-1240. You may also write the Institutional Review Board at Mail Stop #1032, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, KS 66160 or IRBhelp@kumc.edu

<u>Optional Exercise Test</u>
You will also be asked to perform an optional exercise test at your week 0 and week 13 study visits. During this test you will be asked to play Ring-Fit Adventure™ and wear a mask over your face that measures how many calories you burn when you play the game. The research team will also ask you to wear activity trackers on your hip and wrist while you do the test.

You would like to participate in the optional exercise test at your week 0 and week 13 study visits.

☐YES ☐NO

CONSENT

Dr. Ptomey or the research team has given you information about this research study. They have explained what will be done and how long it will take. They explained any inconvenience, discomfort or risks that may be experienced during this study.

By signing this form, you say that you freely and voluntarily agree to be in this research study. You have read the information and had your questions answered.
You will be given a signed copy of the consent form to keep for your records.

_____
Print Participant's Name

_____ _____ _____
Signature of Participant Time Date

_____
Print Name of Person Explaining Consent

_____ _____ _____
Signature of Person Explaining Consent Time Date

CONSENT BY A SURROGATE DECISION-MAKER

You are a relative or other individual who is making decisions on behalf of a person with an intellectual or developmental disability. You are being asked to approve his or her participation in the research study described in this consent form.

By signing this form, you agree that Dr. Ptomey or the study team have given you the information you need to make your decision. The study team has explained what will happen in the research. They explained any inconvenience, discomfort or risks that should be considered. You have had a chance to get your questions answered. At this time, you agree to have the participant enroll in the study.

If the participant becomes able to consent to research during the course of the study, the information in this form will be presented again so they can provide their own consent.

Optional Exercise Test

You are being asked to make a decision on behalf of the participant for an optional exercise test at the week 5 study visit. During this test the individual will be asked to play Ring-Fit Adventure™ and wear a mask over their face that measures how many calories they burn when they play the game. The research team will also ask the individual to wear activity trackers on their hip and wrist while they do the test.

I would like the individual I am make a decision for to participate in the optional exercise test at their week 5 study visit.

☐YES ☐NO

You will be given a signed copy of the consent form to keep for your records.

As legal guardian or representative, I, _____,
Print Name of Guardian/Representative

authorize the participation of _____ in this research study.
Print Name of Participant

I understand that I may not authorize participation in this study if the individual has previously expressed wishes to the contrary, either orally or in writing.

I am (please initial one of the following categories):

_____ Legal guardian or Durable Power of Attorney for Healthcare Decisions

_____ Adult or emancipated minor's spouse (unless legally separated)

_____ Adult child

_____ Parent

_____ Adult relative by blood or marriage

_____	_____	_____
Signature of Legal Guardian/ Representative	Time	Date

_____

Print Name of Person Explaining Consent

_____	_____	_____
Signature of Person Explaining Consent	Time	Date

ASSENT

I am being asked to be in a research study because I have down syndrome. The investigator or the study team has explained the study to me and the person who is making decisions for me.

If I join this study, I will be asked to exercise with a video game at home and have coaching session with the research team each week.

The person who is making decisions for me has read the consent form. He or she has agreed for me to do this research study. If I sign my name, I am saying that I want to be in the study. I know that I don't have to do it even if someone else has given their permission. I know that I can stop being in this study even if I signed my name. If I want to stop at any time, all I have to do is tell the study team.

_____

Print Subject's Name

_____ _____

Signature of Subject Date

Version date: 6/21/2022

Study Title: The Adaption of the GameSquad Exergaming Intervention for Young Adults with Down Syndrome: A Pilot Feasibility Study

I. Purpose, Background and Rationale

A. Aim and Hypotheses

1. The 5-year transitional period between adolescence and young adulthood is known to be a period of increased risk for the development of obesity, unhealthy diet, and low physical activity (PA) levels[1]. The limited research in individuals with Down syndrome (DS), a population with a high prevalence of obesity and higher rates of functional decline, mobility restrictions, frailty, musculoskeletal problems, osteoporosis, and sleep problems, suggests this transition period impacts individuals with DS in a similar manner[1]. Increased moderate-to-vigorous physical activity (MVPA) is associated with improved physical and cognitive function[2]. However, participation in MVPA among adults with intellectual disabilities (ID), including DS is extremely low when compared to typical functioning adults[3]. Adults with DS face unique barriers to participation in MVPA[4,5]. Exergames, which integrate MVPA into video game play are an affordable, accessible, home-based exercise program which has shown effectiveness for increasing MVPA and improving both physical and cognitive function in typically developed populations[6]. An exergaming intervention with individual health coaching called GameSquad has been shown to be effective in improving MVPA and cardiometabolic parameters in children with overweight/obesity and adolescents with neurodevelopmental and psychiatric diagnoses[7,8]. We propose a project to adapt/evaluate the GameSquad intervention for use in adults with DS (GameSquad-DS). We will conduct a 12-wk. single arm pilot trial in 20 young adults with DS to assess the acceptability, appropriateness, and feasibility of the intervention and calculate effect sizes for change MVPA, physical function, muscular strength, physical activity enjoyment, and self-efficacy. Successful completion of this project represents an initial step in achieving our goal of developing effective interventions to increase MVPA and promote healthy aging in adults with DS.
2. Primary aim: To assess the acceptability, appropriateness, and feasibility of the intervention using various quantitative alongside qualitative data. Specifically, we will assess mins/wk of Ring-Fit AdventureTM played, attendance at virtual health coaching sessions, semi-structured interviews, participant retention, and intervention safety measured as number of adverse events.

   Secondary aim: To calculate effect sizes for change across 12-wks. in MVPA, physical function, muscular strength, physical activity enjoyment, and self-efficacy. We hypothesize increases in MVPA, physical function, muscular strength, physical activity enjoyment, and self-efficacy.

   Secondary aim: To determine energy expenditure of a session of Ring-Fit Adventure™ among adults with DS. We hypothesize energy expenditure akin to moderate physical activities.

B. Background and Significance

1. Study Significance: Down syndrome (DS) or trisomy 21 is the most common chromosomal abnormality associated with an intellectual disability (ID). The current incidence of DS is 1 in every 650 live births which is ~30% higher than in 1979, largely due to women conceiving after age 35. Additionally, life expectancy for people with DS has increased dramatically over the past 60 years due to advancements in disease knowledge, medical care, and caregiving services[9]. With this increase in DS prevalence through improved life expectancy, it is critical to address ways to support healthy living throughout their lifespan. Adults with DS have a higher prevalence of obesity[10] and obesity associated health conditions including sleep apnea and type 2 diabetes[11] compared to adults without DS. Additionally, adults with DS face premature aging[12], higher rates and earlier onset of Alzheimer's disease (AD)[13], functional decline, mobility restrictions, frailty, musculoskeletal problems, osteoporosis, and sleep problems when compared with typically developed adults[14]. These Increased rates of chronic disease and functional decline are associated with reduced quality of life, and increased burden on families, care providers, and disability services. Chronic disease also contributes to absenteeism from disability employment, premature withdrawal from the workforce, and increased health care utilization[15].
2. We recently asked 10 adults with DS who visited our lab to complete assessments for an on-going trial (TL1TR002368) to play the introductory game on Ring-Fit Adventure™ for ~15 minutes while wearing a portable accelerometer on a belt at waist. Approximately 7 minutes provided instructions on how to use the game and ~8 minutes predominately light physical activity active play. Participants enjoyed playing the game and felt the game would be feasible and safe for home use. The accelerometer data indicated ~5 minutes of light and ~3 minutes of MVPA, which appeared reasonable based on the types of activities included in the game. Thus, based on these preliminary results we propose to adapt the GameSquad intervention using the Ring-Fit Adventure™ as our exergaming platform for use in transition age young adults with DS (18-25 yrs.)
3. Literature Review: A 24-wk. randomized trial in 46 children with overweight/obesity using a home-based intervention which incorporates exergaming (Xbox Kinect) with individual health coaching called GameSquad demonstrated reduced BMI-z score ($p=0.016$) and improved systolic and diastolic blood pressure, total and low-density lipoprotein cholesterol, and MVPA relative to wait-list control (all $p < 0.05$)[7]. Members of our study team recently conduct a 10-wk pilot trial of the game GameSquad intervention (3 exergaming sessions/wk., plus 6 health coaching sessions) adapted for use with adolescents with neurodevelopmental and psychiatric diagnoses ($n=23$, age ~ 15 yrs.)[8]. Participants reported an average of ~82 min/wk. of exergaming and completed 83% of the scheduled health coaching sessions. Unfortunately, both the original and Adaptive GameSquad interventions used the Xbox Kinect gaming system which was discontinued in 2017. Nintendo Ring-Fit Adventure™ is a novel, and currently popular exergame that uses both a resistance ring and body weight to perform numerous upper and lower body cardiovascular and resistance exercises. In contrast to other exergames, participants incorporate exercise to complete an adventure narrative guided by Ring-Fit Adventure™ characters. The narratives provide ~60 hours of unique activity which increases in both intensity and difficultly as participants progress through the game. Participant exercise is guided by both written instructions and visual demonstrations via an in-game avatar. Feedback regarding proper exercise form is provided by controllers/ accelerometers

imbedded in the game ring. Formative work by Dr. Bowling found that Ring-Fit Adventure™ was the most enjoyable and user-friendly of the 4 evaluated exergames.

C. Rationale

1. The original GameSquad among children and the adapted GameSqaud among adolescents with neurodevelopmental and psychiatric diagnoses have both demonstrated strong potential. We now want to further adapt the GameSqaud concept for young adults with Down Syndrome.
2. Successful completion of this project represents an initial step in achieving our goal of developing effective interventions to increase MVPA and promote healthy aging in adults with DS.

II. Research Plan and Design

A. Study Objectives: Primary aim: To assess the acceptability, appropriateness, and feasibility of the intervention using quantitative data alongside qualitative data. Specifically, we will assess mins/wk of Ring-Fit Adventure™ played, attendance at virtual health coaching sessions, semi-structured interviews, participant retention, and intervention safety measured as number of adverse events.

B. Secondary aims: To calculate effect sizes for change across 12-wks. in MVPA, physical function, muscular strength, physical activity enjoyment, and self-efficacy.

C. Exploratory aim: To determine energy expenditure of a session of Ring-Fit Adventure™ among adults with DS.

D. Study Type and Design: Single-Group, Pretest-Posttest.

E. Sample size, statistical methods, and power calculation

1. We will calculate point estimates and confidence intervals for all endpoints of interest and will use effect sizes estimated from this data to guide power analyses for future trials. We expect a positive change in MVPA, and in 1 measure of physical function. Continuation to a larger trial will be based on a positive response in at least one of these endpoints.
2. N=20. The sample size was determined from the number of subjects that could feasible be recruited in the 1-year timeline for the grant and within the grant budget.

F. Subject Criteria (See Vulnerable Populations appendix, if applicable): Primary care physician (PCP) clearance will be required for all participants. A form with PCP clearance will need to be signed before participation will be allowed. Inclusion criteria: 1) Young adults (18-30 yrs.) 2) Diagnosis of DS as determined by a Community Service Provider operating in our recruitment area under the auspices of a Community Developmental Disability Organization (CDDO). 3) Sufficient functional ability to understand directions, communicate preferences, wants, and needs through spoken language. 4) Living at home with a parent/guardian or in a supported living environment with a parent/caregiver who agrees to serve as a study partner. Exclusion criteria: 1) Unable to participate in MVPA. 2) Serious medical risk, e.g., cancer, recent heart attack, stroke, angioplasty as determined by their primary care provider (PCP).

1. Inclusion criteria: 1) Young adults (18-30 yrs.) 2) Diagnosis of DS as determined by a Community Service Provider operating in our recruitment area under the auspices of a

Community Developmental Disability Organization (CDDO). 3) Sufficient functional ability to understand directions, communicate preferences, wants, and needs through spoken language. 4) Living at home with a parent/guardian or in a supported living environment with a parent/caregiver who agrees to serve as a study partner.

2. Exclusion criteria: 1) Unable to participate in MVPA. 2) Serious medical risk, e.g., cancer, recent heart attack, stroke, angioplasty as determined by their primary care provider (PCP)
3. Withdrawal/Termination criteria: If at anytime during the intervention, the participant becomes unable to participate in exercise sessions, participation will be terminated by the investigator. If the participant asks to be withdrawn from the study, the participant will be removed.
4. A study subject can participate in another study while participating in this research study.

E. Specific methods and techniques used throughout the study

1. Laboratory tests: Physical function will be assessed using the 6-minute walk test[16], Timed Up and Go test[17], and the Y-Balance Test[18].

2. Leg strength will be assessed using a standard 5-repetition maximum protocol[19] on a Cybex plate-loaded leg press. Hand grip strength of both the dominant and non-dominant hands will be assessed with a Jamar handgrip dynamometer (JWL Instruments, Chicago, IL)[20].

3. Daily physical activity, specifically MVPA, will be accessed using a Fitbit that will be synced to a tablet computer (iPad). Daily physical activity across the 12-week study activity will be assessed using a Fitbit Versa 3 monitor worn on the non-dominant wrist during each day of the intervention. Real-time data from the Fitbit will be transferred via Fitbit's Open API using R, thus participant burden is minimal. Immediate participant feedback via a graphic display of daily steps, minutes of sedentary time, time spent in light, moderate and vigorous PA will be available on the iPad. This data, accessible to health educators, will be used to provide motivation and feedback during the virtual coaching sessions. Participants will be reminded to wear and charge the Fitbit during the individual support/education sessions and will receive automatic reminder messages via the iPad.

Study Procedures: 6-minute walk test (6-minutes), Timed Up and Go test (5-minutes), and the Y-Balance Test (5-minutes). Leg strength will be assessed using a standard 5-repetition maximum protocol (5-minutes) on a Cybex plate-loaded leg press. Hand grip strength of both the dominant and non-dominant hands will be assessed with a Jamar handgrip dynamometer (JWL Instruments, Chicago, IL), (5-minutes). Physical activity enjoyment will be assessed using the Physical Activity Enjoyment Scale (10-minutes). Self-efficacy will be assessed using the Self-Efficacy for Activity for Persons with Intellectual Disabilities Scale (10-minutes). Energy expenditure of a ring-fit session will be assessed in a volunteer sample of both patient and caregiver using a previously validated portable, open-circuit indirect calorimeter (Cosmed, Italy) which measures breath-by-breath ventilation, expired oxygen, and carbon dioxide. Study staff will schedule the assessment with participants which will involve a visit to the lab. The flow turbine will be calibrated using a 3.0-L syringe. The lightweight (~1.5 kg) portable system will be attached by a harness around the waist and shoulders of the participant

before each assessment. The device will be programmed utilizing study ID numbers, with no other identifying information. During exercise sessions, participants will breathe into a facemask that directs air into the unit housing the O2 and CO2 analyzers. Data will be retrieved for analysis via a serial port interface and downloaded to a university monitored, HIPPA compliant computer once staff returns to campus. Software provided with the calorimeter will be used to analyze data by aggregating over 20-second epochs for the calculation of 1-min averages. MET levels will be age corrected using the Schofield equation[21] as recommended by McMurray et al[22]. Participants will be asked to wear both hip and wrist ActiGraphs during the assessment for comparison of physical activity levels between devices.

4. Timeline:

Timepoint	Action	Duration/Delivery
Week 0	Pre-Testing. 6-minute walk test, Timed Up and Go test, Y-Balance Test. 5-repetition maximum Leg Press, Hand grip strength (both hands). Physical Activity Enjoyment Scale, Self-Efficacy for Activity for Persons with Intellectual Disabilities Scale. RF Set-up Fitbit/iPad Set-Up	120 minutes. Kirmayer Fitness Center
Week 1	Intervention (RF sessions + virtual health coaching session)	90 minutes At home RF sessions, virtual health coaching on zoom.
Week 2	Intervention (RF sessions + virtual health coaching session)	120 minutes At home RF sessions, virtual health coaching on zoom.
Week 3	Intervention (RF sessions + virtual health coaching session)	150 minutes At home RF sessions, virtual health coaching on zoom.
Weeks 4-12	Intervention (RF sessions + virtual health coaching session)	180 minutes At home RF sessions, virtual health coaching on zoom.
Week 13	Post-Testing 6-minute walk test, Timed Up and Go test, Y-Balance Test. 5-repetition maximum Leg Press, Hand grip strength (both hands). Physical Activity Enjoyment Scale, Self-Efficacy for Activity for Persons with Intellectual Disabilities Scale.	120 minutes. Kirmayer Fitness Center

	Qualitative Interview Energy Expenditure Test (Cosmed)	

Time frame for completion: Months 1-5: Recruit participants, complete the 12-week pilot trial of GameSquadDS, and conduct post intervention semi-structured interviews. Month 6: Complete data analysis for all process and physical outcomes.

F. Risk/benefit assessment:

1. Physical risk- "You might have muscle soreness, fatigue, nausea, dizziness. There is a very rare chance of unpredictable changes in blood pressure or heart rhythm, and heart attack."
2. Psychological risk- "You might feel uncomfortable answering some of the questions in the questionnaire."
3. Social risk- N/A
4. Economic risk- N/A
5. Potential benefit of participating in the study
    a. Being in this study could help you find another method of exercise you enjoy. This may prove useful for future exercise behavior after acquiring Ring-Fit Adventure™ and a Nintendo Switch™ at the conclusion of participation.
    b. The researchers might learn more about how to get adults with Down syndrome to exercise.
    c. There is currently considerable interest in increasing physical activity in adults with disabilities. This may prove beneficial to that effort.

G. Location where study will be performed: Kirmayer Fitness Center

H. Personnel who will conduct the study, including:

1. Indicate, by title, who will be present during study procedure(s): Kameron Suire, Joseph Sherman, Annie Rice
2. Primary responsibility for the following activities, for example:
    a. Determining eligibility: Joseph Sherman
    b. Obtaining informed consent: Joseph Sherman
    c. Providing on-going information to the study sponsor and the IRB: Kameron Suire
    d. Maintaining participant's research records: Annie Rice
    e. Completing physical examination: Joseph Sherman
    f. Taking vital signs, height, weight: Joseph Sherman
    g. Performing / conducting tests, procedures, interventions, questionnaires: Joseph Sherman
    h. Completing study data forms: Joseph Sherman
    i. Managing study database: Annie Rice

I. Assessment of Subject Safety and Development of a Data and Safety Monitoring Plan

1. Elements of the plan include:
    a. Persons/groups who will review the data (study team; independent safety monitor, data monitoring committee or formal DSMB): Study Team
    b. Data/events that will be reviewed: Subject accrual (adherence to protocol regarding demographics, inclusion/exclusion) and Adverse Event Rates
    c. Frequency of review: Monthly
    d. Types of analyses to be performed: Means
    e. Safety-related triggers that would cause the PI to stop or alter the study: The most likely scenario indicating the need to stop the investigation would be a failure to recruit or deliver the intervention as planned. Another issue relating to stopping rules for this trial would be new information. It is unlikely that any new information will become available during this trial that would necessitate stopping the trial
2. Data on adverse events will be reported monthly to the PI throughout this trial. We anticipate that most adverse events will be mild in nature and will allow a complete return to the same activities after a short period of time; that is, later that day or a day or two later.
3. We anticipate most adverse events (if not all) will allow a complete return to the same activities after a short period of time; that is, later that day or a day or two later. However, if a serious adverse event that prohibits participation moving forward, the participant will be terminated from the intervention.

III. Subject Participation

A. Recruitment:

1. The recruitment plan was informed by our experience with completed projects where we successfully recruited adults with DS (DK083539, HD094704, AG036909). As in our previous trials, project staff will contact local community agencies serving adults with DS, case managers, and CDDOs by mail or email, provide presentations at CDDO meetings, and text for CDDO newsletters describing the project. Interested adults with DS or their parent/caregiver will be asked to contact the study coordinator via email, our website, or a dedicated toll-free study phone number that will be included in all recruitment materials. The study coordinator will contact interested individuals by phone to answer questions and conduct an initial eligibility screen. Zoom® meetings will be scheduled with those remaining interested and potentially eligible to complete eligibility screening and to obtain informed consent or parent/guardian consent and participant assent in cases where the participant has a surrogate decision maker. We will attempt to recruit ~50% female and ≥ 30% minorities. Study staff will forward a form to the PCP requesting permission to participate.

Screening Interview/questionnaire: Screening for potential study participants will be done using an interest and enrollment questionnaire (IEQ). The IEQ will have relevant qualification criteria based on the inclusion criteria for the pilot study. It will also have contact information for potential study participants to allow the principal investigator or study coordinator to reach the parent, legal guardian, or caregiver of the adult with DS. A

REDCap link to the IEQ will be distributed on the flyer and data will be stored in the secure, HIPAA-compliant database. Potential participants who meet the eligibility criteria for the research study will be contacted to review the study and the informed consent.

Questions for the questionnaire include:

- Do you have Primary Care Physician clearance to participate?
- Are you between 18-30 years old?
- Have you been diagnosed with DS?
- Do you have the ability to understand directions, communicate preferences, wants, and needs through spoken language?
- Are you living at home with a parent/guardian or in a supported living environment with a parent/caregiver who agrees to serve as a study partner?
- Are you able to participate in moderate to vigorous exercise?
- Do you have a serious medical risk (e.g., cancer, recent heart attack, stroke, angioplasty)?

The study coordinator will contact interested individuals by phone to answer questions and conduct an initial eligibility screen. Zoom® meetings will be scheduled with those remaining interested and potentially eligible to complete eligibility screening and to obtain informed consent or parent/guardian consent and participant assent, via Redcap,in cases where the participant has a surrogate decision maker

B. Informed consent process and timing of obtaining of consent

1 Kameron Suire will obtain written informed consent.

2 Remote video chat sessions (Zoom) will be scheduled with participants and their legal guardian (if they are not their own guardian) who are deemed to be initially eligible to participate. This video chat session will provide an opportunity to describe the project in detail, answer questions, verify eligibility, and to obtain consent and assent. Prior to the consenting session, the participant will be sent the consent form and cover letter through The University of Kansas Medical Center's (KUMC) secure email system. The study team will use the "share screen" option on Zoom to walk through each section of the consent document while noting questions that arise and answering these questions fully. Participants who are willing to participate in the study will sign and date the consent and/or assent forms electronically via REDCap. Participants/caregivers will be given unlimited time to make the decision on whether to participate. The study team member who conducted the consent meeting will also sign and date after reviewing the signed consent forms and verifying completeness. Study staff will provide the participant with a fully signed consent form for their records. Medical consent from the participant's physician will also be obtained prior to enrollment in the study. The physician will receive a description of the study and a request for medical clearance to participate in the physical activity

3 Subjects whom are not their own legal guardian will require a caregiver to give consent. Kameron Suire will make the determination.

C. Alternatives to Participation: The Alternative to participation would be not enroll in the study.

D. Costs to Subjects: There will be no cost to the subject for any testing or participation related to this study.

E. How new information will be conveyed to the study subject and how it will be documented: It is unlikely that new information would be presented during this study, however, the study team would review new information and take action accordingly.

F. Payment, including a prorated plan for payment: Participants will be provided with Fitbit, Ring-Fit Adventure™ and the Nintendo Switch™ gaming system if eligible and after completing the pre-testing appointment. Participants will need to complete the intervention to keep the Fitbit, Ring-Fit Adventure™, and the Nintendo Switch™. Travel costs will not be reimbursed.

G. Payment for a research-related injury: Participants will not be paid for a research-related injury.

IV. Data Collection and Protection

A. Data Management and Security:

1. Data will be entered into separate tables via the web using SSL encryption, and stored in a secure SQL database, housed behind a HIPAA compliant firewall. Database access will be limited to primary investigators and study coordinator. Data will be linked by participant ID. Identifiable information and outcome data will be stored separately. Only de-identified data will be available to study personnel. Research assistants, blinded to intervention assignment, will complete all data entry. All personnel have current Human Subjects/HIPPA certificates. Kameron Suire, Lauren Ptomey, and Robert Montgomery will have access to the data.
2. Data will be entered into separate tables via the web using SSL encryption, and stored in a secure SQL database, housed behind a HIPAA compliant firewall. Database access will be limited to primary investigators and study coordinator. Data will be linked by participant ID. Identifiable information and outcome data will be stored separately. Only de-identified data will available to study personnel. Research assistants, blinded to this intervention will complete all data entry. All personnel have current Human Subjects/HIPAA certificates.
3. Participant IDs will be utilized.
4. Kameron Suire will have access to the code.
5. Data will be linked by participant ID. Identifiable information and outcome data will be stored separately.
6. Data will be entered into separate tables via the web using SSL encryption, and stored in a secure SQL database, housed behind a HIPAA compliant firewall. Database access will be limited to primary investigators and study coordinator. Data will be linked by participant ID. Identifiable information and outcome data will be stored separately. Only de-identified data will available to study personnel. Research assistants, blinded to this intervention will complete all data entry. All personnel have current Human Subjects/HIPAA certificates.

B. Procedures to protect subject confidentiality: Data will be entered into separate tables via the web using SSL encryption, and stored in a secure SQL database, housed behind a HIPAA compliant firewall. Database access will be limited to primary investigators and study

coordinator. Data will be linked by participant ID. Identifiable information and outcome data will be stored separately. Only de-identified data will available to study personnel.

C. Quality Assurance / Monitoring

1. Research personnel will be observed by co-investigators for their first three sessions. Feedback will be given to ensure future sessions go as planned.
2. There are no plans to have third-party monitoring.

V. Data Analysis and Reporting

A. Statistical and Data Analysis: We will calculate point estimates and confidence intervals for all endpoints of interest and will use effect sizes estimated from this data to guide power analyses for future trials. We expect a positive change in MVPA, and in 1 of the measures of physical function. Continuation to a larger trial will be based on a positive response in at least one of these endpoints.

Thematic analysis will be used to analyze qualitative data completed by research personnel[23].

B. Outcome: We expect a positive change in MVPA, and in 1 of the measures of physical function. Continuation to a larger trial will be based on a positive response in at least one of these endpoints.

C. Study results to participants: All results will be given to the subjects after completion of the post-testing appointment. An interview will be given going over the results and giving the participants a hand-out of all outcomes. This is due to the potential of positive results after being physically active, and could have ramifications on future behavior.

D. Publication Plan: Publication will be sought as a pilot, feasibility study based on quantitative and qualitative results from all outcomes.

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APPENDIX I: VULNERABLE POPULATIONS

I. We have a consent form for surrogate decision maker. We also have assent. These are available in our informed consent materials.

II. Cognitively or decisionally impaired individuals: We have a consent form for surrogate decision maker. This is available in our informed consent materials.