# Development of a Weight Loss Intervention Considering Resource Constraints

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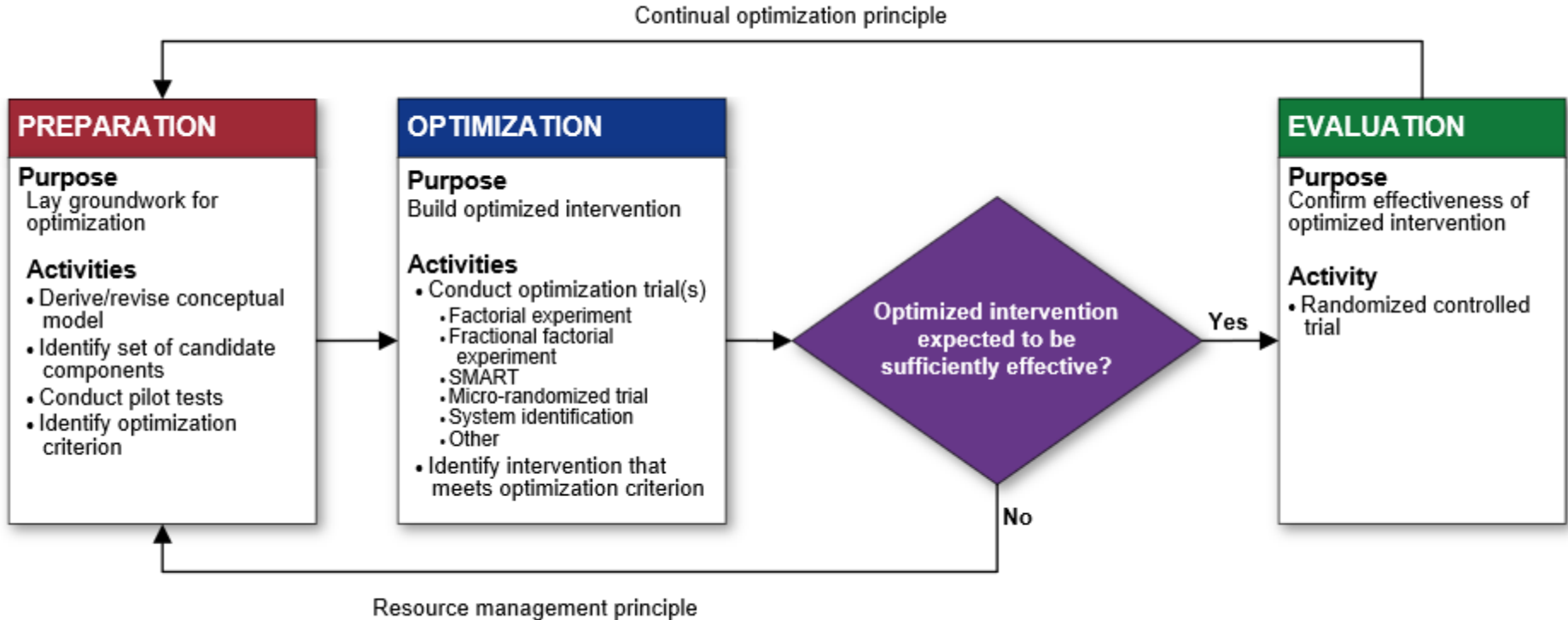Angela@northwestern.edu
Twitter: @Apfam

# Problems in Obesity Treatment

**ibtn**
international
behavioural
trials network

- Weight loss treatments are often costly and burdensome

Self-monitoring

Group sessions

Feedback

Goal setting

Stimulus control

## Behavioral Programs

Social support

Individual sessions

Relapse prevention

Education

# Multiphase Optimization Strategy: Intervention Development



Collins, L. M. (2018). *Optimization of behavioral, biobehavioral, and biomedical interventions: the multiphase optimization strategy (MOST)*. Springer

# Intervention Component Development and Piloting



Continual optimization principle

**PREPARATION**

**Purpose**
Lay groundwork for optimization

**Activities**
- Derive/revise conceptual model
- Identify set of candidate components
- Conduct pilot tests
- Identify optimization criterion

**OPTIMIZATION**

**Purpose**
Build optimized intervention

**Activities**
- Conduct optimization trial(s)
  - Factorial experiment
  - Fractional factorial experiment
  - SMART
  - Micro-randomized trial
  - System identification
  - Other
- Identify intervention that meets optimization criterion

Optimized intervention expected to be sufficiently effective?

Yes

No

**EVALUATION**

**Purpose**
Confirm effectiveness of optimized intervention

**Activity**
- Randomized controlled trial

Resource management principle

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# Component Selection

Components meet 3 criteria:

a. relative cost/burden is known
b. relative impact on weight loss is unknown
c. can be delivered remotely

1. Coaching Call Levels (weekly vs every 2 weeks)
2. Meal Replacements
3. Progress Report to Physician
4. Train a Buddy to be Supportive
5. Text Messages

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# Setting up a Conceptual Model

# ENLIGHTEN Feasibility Study
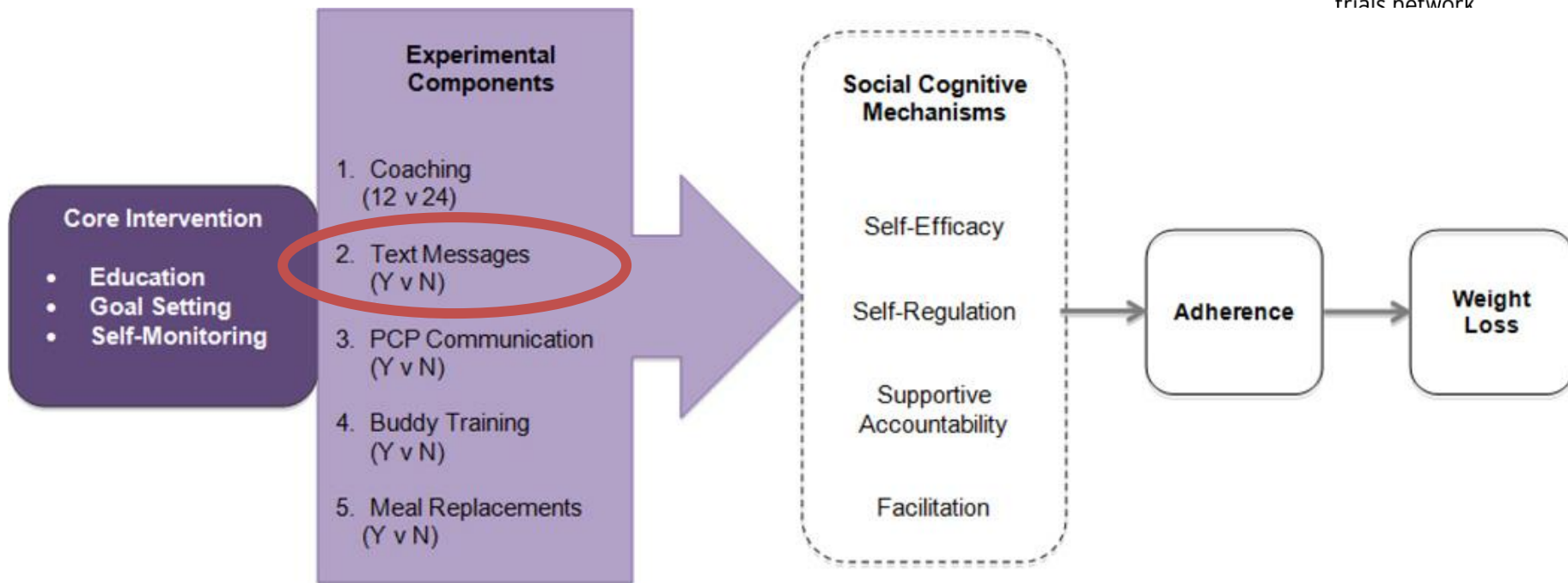
- Create messages, test the delivery mechanism, determine preferences for frequency
- Non-randomized, pre-post pilot study
- 9 participants (6/9 Female, 5/9 Black, Mean age 42.4 years, mean BMI 31.8)
- Completers (n=8) lost a range of +.75 − -14.75 lbs
- Preference for 1.8 texts per day on 4.3 days of the week (2-7 texts)

**CONCLUSIONS**

- We needed to automate the text message delivery
- Participant preference vary wildly; tailoring important

Pfammatter AF, Marchese SH, Pellegrini C, Daly E, Davidson M, Spring B. Using the Preparation Phase of the Multiphase Optimization Strategy to Develop a Messaging Component for Weight Loss: Formative and Pilot Research. JMIR Form Res 2020;4(5):e16297 DOI: 10.2196/16297 PMID: 32347804

**Figure 4.** Optimization of Remotely Delivered INtensive Lifestyle Treatment for Obesity Study (Opt-IN) message tailoring: adherence to self-monitoring example.
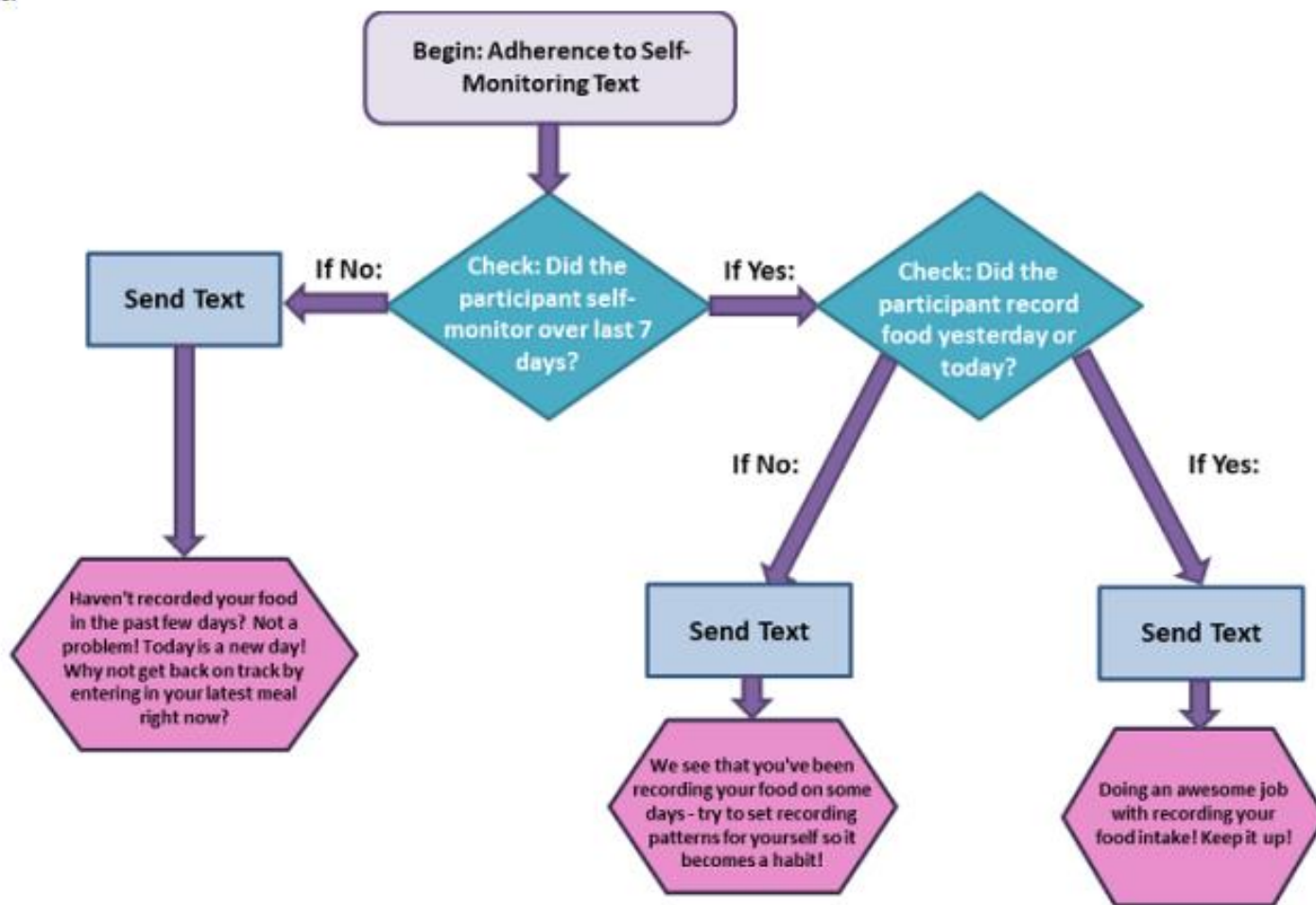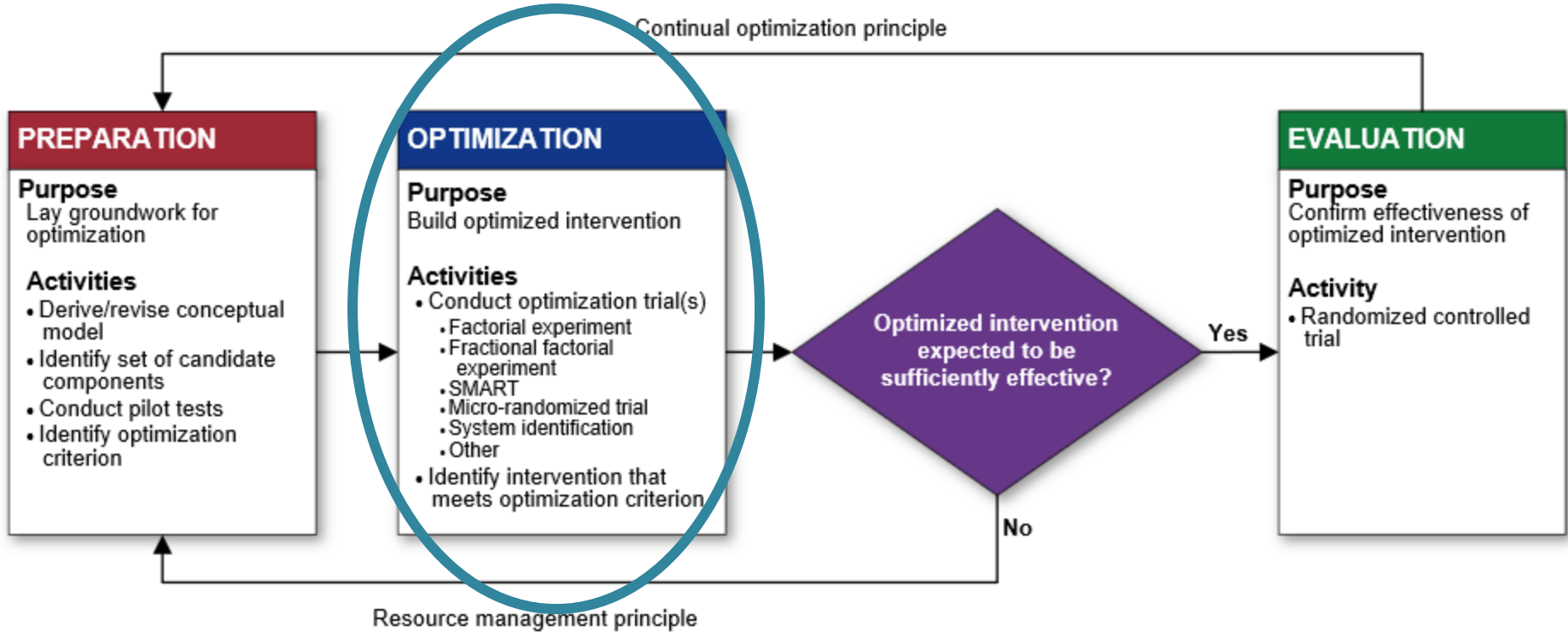
# Optimization of a Multicomponent Treatment



Collins, L. M. (2018). *Optimization of behavioral, biobehavioral, and biomedical interventions: the multiphase optimization strategy (MOST)*. Springer

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# The Opt-IN Trial

Design maximally effective and efficient weight loss intervention such that all components are active, feasible for real world implementation, and make lowest possible resource demands

AIM 1: **Identify which components/component levels**, contribute most to weight loss among adults with overweight and obesity over a 6-month period.

AIM 2: **Apply results to build** an intervention with only active components that costs less that $500 USD

Pellegrini CA, Hoffman SA, Collins LM, Spring B. Optimization of remotely delivered intensive lifestyle treatment for obesity using the multiphase optimization strategy: Opt-in study protocol. *Contemporary clinical trials*. 2014;38:251-259

# Opt-IN Design

N = 562 (81.5% female, BMI 32.2 (3.6) kg/m$^2$)

All participants received CORE intervention and randomized to one of 32 conditions comprised of different combinations of components
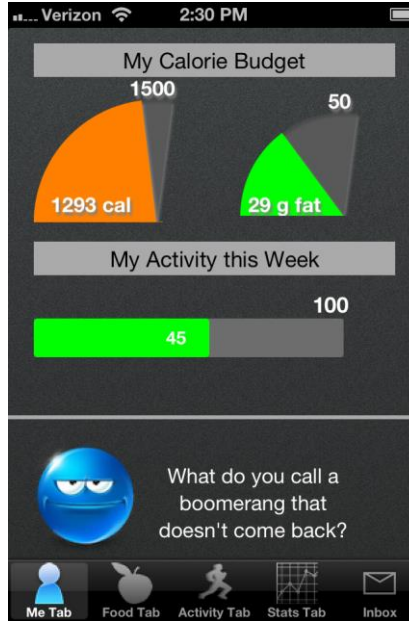


**Table 2**
Full Factorial Design with 32 conditions.

| Condition | Coaching Sessions | Report to PCP | Text Messages | Meal Replacement Recommendations | Buddy Training |
|---|---|---|---|---|---|
| 1 | 12 | YES | NO | NO | NO |
| 2 | 12 | YES | NO | YES | YES |
| 3 | 12 | YES | YES | NO | YES |
| 4 | 12 | YES | YES | YES | NO |
| 5 | 12 | NO | NO | NO | YES |
| 6 | 12 | NO | NO | YES | NO |
| 7 | 12 | NO | YES | NO | NO |
| 8 | 12 | NO | YES | YES | YES |
| 9 | 24 | YES | NO | NO | NO |
| 10 | 24 | YES | NO | YES | YES |
| 11 | 24 | YES | YES | NO | YES |
| 12 | 24 | YES | YES | YES | NO |
| 13 | 24 | NO | NO | NO | YES |
| 14 | 24 | NO | NO | YES | NO |
| 15 | 24 | NO | YES | NO | NO |
| 16 | 24 | NO | YES | YES | YES |
| 17 | 12 | NO | NO | NO | NO |
| 18 | 12 | NO | NO | YES | YES |
| 19 | 12 | NO | YES | NO | YES |
| 20 | 12 | NO | YES | YES | NO |
| 21 | 12 | YES | NO | NO | YES |
| 22 | 12 | YES | NO | YES | NO |
| 23 | 12 | YES | YES | NO | NO |
| 24 | 12 | YES | YES | YES | YES |
| 25 | 24 | NO | NO | NO | NO |
| 26 | 24 | NO | NO | YES | YES |
| 27 | 24 | NO | YES | NO | YES |
| 28 | 24 | NO | YES | YES | NO |
| 29 | 24 | YES | NO | NO | YES |
| 30 | 24 | YES | NO | YES | NO |
| 31 | 24 | YES | YES | NO | NO |
| 32 | 24 | YES | YES | YES | YES |

# Decision Making

| # | Combination | | | | | Estimated Effects | | | Cost |
|---|---|---|---|---|---|---|---|---|---|
| | Calls | Text Message | Meal Replacement | PCP Report | Buddy Training | 6-mo weight change (kg) | % achieving 5% wt loss | % achieving 7% wt loss | |
| 21 | 12 | No | No | Yes | Yes | -6.1112 | 57.13 | 51.77 | $427 |
| 1 | 12 | No | No | Yes | No | -3.3966 | 34.48 | 25.86 | $337 |
| 5 | 12 | No | No | No | Yes | -5.0540 | 46.56 | 31.02 | $414 |
| 17 | 12 | No | No | No | No | -5.2389 | 52.95 | 41.17 | $324 |

Spring, B.J., **Pfammatter, A.F**., *Marchese, S.H.*, Stump, T., Pellegrini, C., McFadden, H.G., Hedeker, D., Siddique, J., Jordan, N., Collins, L.M. (In Press). A factorial experiment to optimize remotely delivered behavioral treatment for obesity: Results of the Opt-IN study. *Obesity*

# Decision Making

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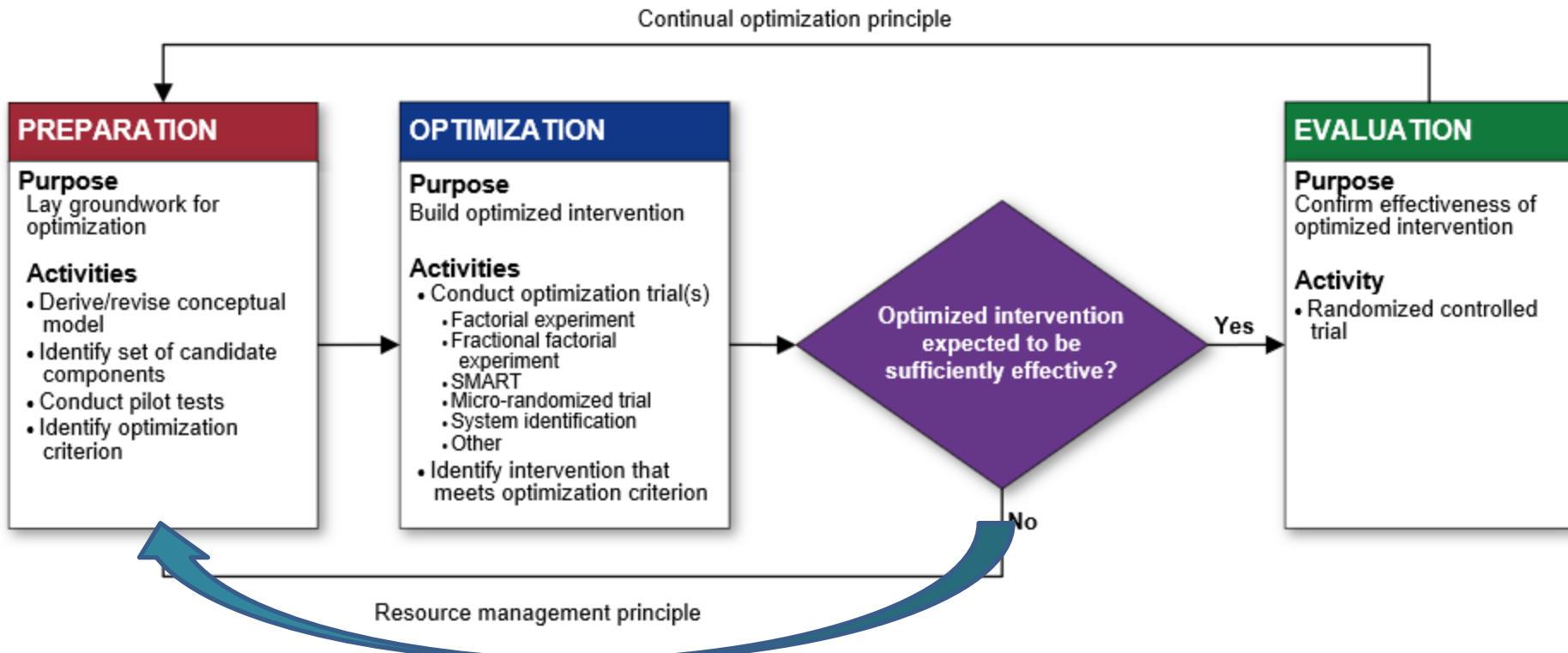
# Decision Making

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Column group headers: **Combination** spans Calls, Text Message, Meal Replacement, PCP Report, Buddy Training. **Estimated Effects** spans 6-mo weight change (kg), % achieving 5% wt loss, % achieving 7% wt loss. **Cost** is the final column.
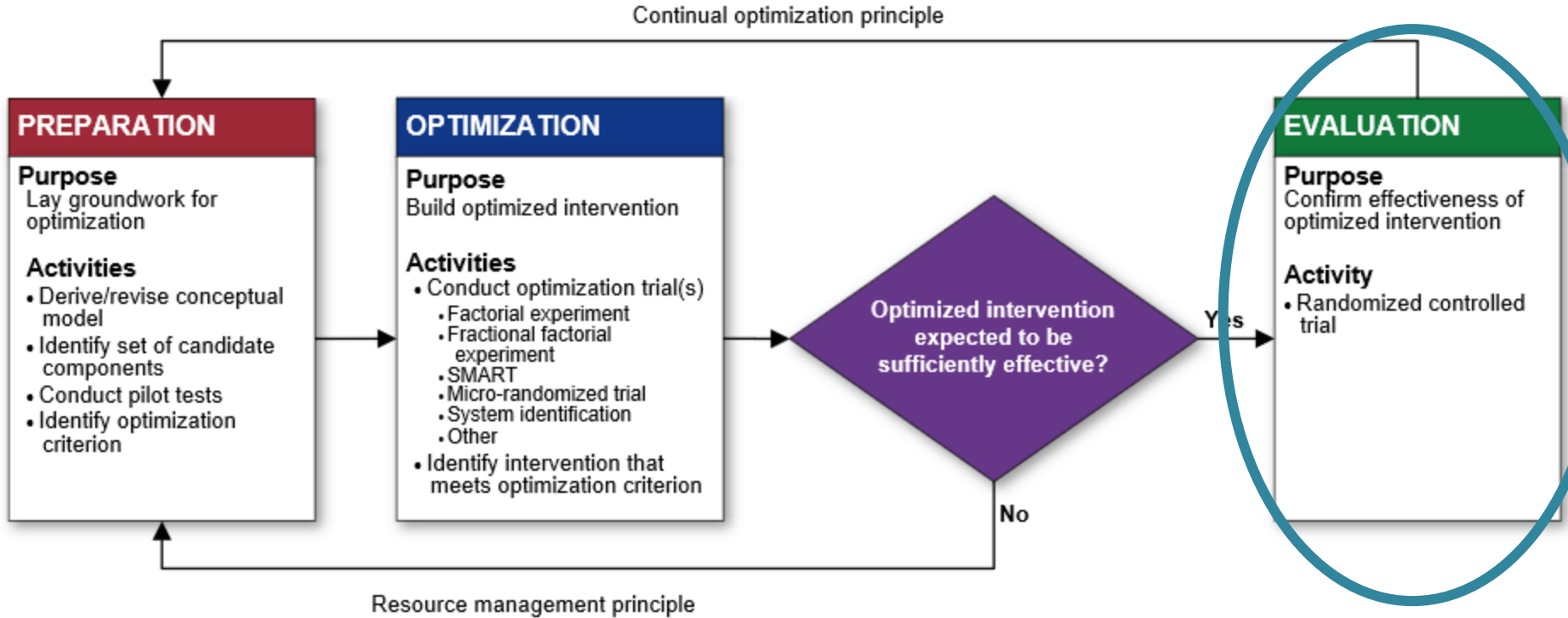
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# Continual Optimization Principle



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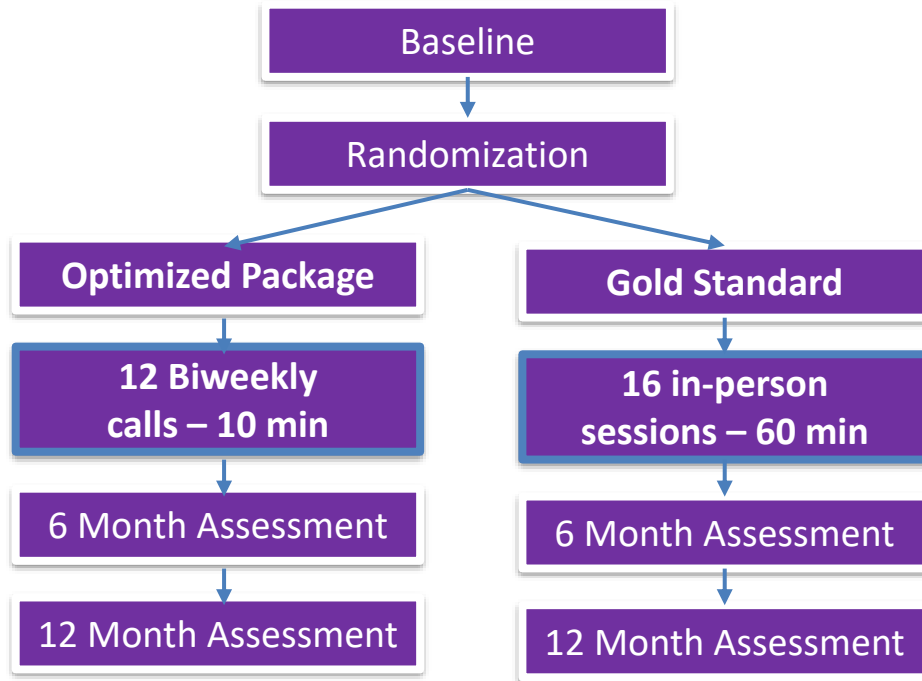Resource management principle

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# Moving on to Evaluation

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Resource management principle

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# Thank You!

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**ibtn** international behavioural trials network

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