Engagement in Digital Interventions

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Setting Up the Problem

Why Digital Interventions?

- Mobile & wireless tech increasingly deliver psychological interventions — from self-guided tools (mood tracking, meditation) to full therapies (CBT, ACT)

- Smart devices enable **Just-in-Time Adaptive Interventions (JITAIs)** — the right support, at the right moment, with minimal burden

- Despite this promise, research on how these interventions actually interact with people remains underdeveloped

The Attrition Problem

- **The law of attrition (Eysenbach, 2005):** people drop out before completing, or simply stop using the technology

- Worldwide average app retention: <u>≤5% after 30 days</u> (Statista, 2020)

- Low engagement is consistently blamed — but what is engagement?

A Construct Without a Definition

- Engagement is central across psychology — occupational, clinical, educational, health

- No agreed-upon definition exists; each field defines it on its own terms

- **This paper's goal:** synthesize across fields into one clear definition, then explain how engagement actually unfolds moment-to-moment

What Is Engagement, Really?

Engagement Means Different Things to Different Fields

- **Education:** effort devoted to purposeful learning activities
- **I/O Psychology:** emotional & intellectual commitment to one's job
- **HCI:** the quality of a user's experience with technology
- **Healthcare:** the actions patients take to support their own health
- **Marketing:** intensity of participation with a brand's offerings

Three Threads That Tie These Together

- Energy Investment — engagement is fundamentally about directing energy somewhere
- State vs. Trait — is it stable, or does it fluctuate moment to moment?
- Multidimensional — physical + affective + cognitive, not just one piece.

Engagement as Energy Investment

- Rooted in Kahn's (1990) work on employee engagement — energy invested into one's work role

- Energy is described as "a type of positive affective arousal" (Quinn & Dutton, 2005)

- Energy alone isn't engagement — it has to be channeled toward a **specific stimulus or task**

Engagement as a State (Not Just a Trait)

- Work-engagement research often treats it as relatively stable between people

- HCI research treats it as a dynamic, fluctuating state

- ~88% of variance in employee engagement happens within a person, activity to activity (Reina-Tamayo et al., 2017)

- **The paper's position:** engagement can be relatively stable, but it definitely goes up and down over time.

Hands, Heart, and Head

- **Physical energy** → actual performance ("behavioral engagement," "participation")

- **Affective energy** → positive feelings toward the task (pride, enthusiasm, satisfaction)

- **Cognitive energy** → selective attention & processing — distinct from "flow," which is a peak state, not a requirement

- **True engagement** = simultaneous investment of all three (Rich et al., 2010)

The Proposed Definition

- **Engagement** is a state of energy investment involving physical, affective, and cognitive energies directed toward a focal stimulus or task.

- **Stimulus:** an external cue meant to elicit a behavior (e.g., a push notification)

- **Task:** the actual performance requirement (e.g., a 5-minute walk)

Distinguishing Engagement From Look-Alike Constructs

How Engagement Differs From...

Table 1

Comparison of Engagement to Other Related Constructs

Construct	Definition	Distinctions from engagement	Examples focusing on a particular task: self-monitoring dietary intake via a mobile app
Engagement	A state of energy investment involving physical, affective, and cognitive energies directed toward a focal stimulus or task	N/A	An individual uses the app to self-monitor their dietary intake while making an effort to accurately record the information and appreciating the opportunity to self-reflect
Adherence	The extent to which an individual follows the intended suggestions to complete a focal task (e.g., Bissonnette, 2008)	A person may engage in a task without following instructions	A patient follows their doctor's instructions to self-monitor dietary intake twice per day via a mobile app for 2 weeks
Involvement	"Cognitive or belief state of psychological identification" (Kanungo, 1982, p. 342)	(a) Engagement with a task does not require psychological identification with the task and (b) involvement is mainly a cognitive state (rather than a state of energy investment)	An individual considers self-monitoring dietary intake via the mobile app as very central to their health and well-being
Participation	The investment of physical energy in an activity (Davis et al., 2007)	Participation does not necessarily include the investment of affective or cognitive energies	An individual uses a mobile app to self-monitor dietary intake
Commitment	A long-term orientation toward a course of action, including feelings of psychological attachment and intentions to persist (e.g., Meyer & Allen, 1997)	(a) Engagement in a task may not require a long-term orientation or intentions to persist and (b) commitment primarily describes emotional attachment or intentions rather than actual investment of energies	An individual intends to continue using a mobile app to self-monitor dietary intake in the long term
Motivation	An affective drive for action that leads one to approach reward or avoid punishment (Kahn, 1990)	Captures an individual's drive (the reason for engagement) rather than the investment of energy	An individual experiences an internal drive to self-monitor dietary intake via the app because they appreciate the benefits of doing so
Flow	A high degree of concentration and interest in an activity (e.g., Csikszentmihalyi, 2020)	Represents a unique "peak" in cognitive absorption	An individual is highly concentrated on self-monitoring dietary intake via the mobile app
Persistence	Continued adherence (e.g., Clowes et al., 2004) or continued investment of effort in a task despite obstacles or difficulty (e.g., Howard & Crayne, 2019)	Persistence primarily describes continued investment of cognitive or physical (rather than affective) energies in a task	An individual makes continued attempts to self-monitor dietary intake via the mobile app

Effective, Positive, and Negative Engagement

What Makes Engagement "Effective"?

- Engagement itself is neutral — effectiveness only makes sense relative to a distal (long-term) outcome

- Key questions: what level, with what, and for how long is actually needed?

- Recovery matters: balancing engagement with periods of detachment supports engagement over time (Bakker, 2014)

- **Effective engagement** is the extent, frequency, and duration of investment of physical, cognitive, and affective energies in a focal stimulus or task needed to bring about a pre-specified outcome.

Engagement Has a Dark Side Too

- Most research focuses on the bright side — positive thoughts, feelings, behaviors

- But negative engagement is real — anger, complaining, deliberate negative action (not just passive disengagement)

- People can be positively and negatively engaged at the same time (e.g., trust/distrust coexisting; enjoying and suffering from the same app)

- Whether engagement is good still depends on **the outcome you care about**

Engagement in Digital Interventions, Specifically

Engagement With *What*, Exactly?

- Digital interventions use stimuli (notifications, nudges) to drive engagement with a task — digital or non-digital

- Key design question: are we engaging someone with the stimulus, the digital content, or the real-world task?

- Nudges modify behavior without forbidding any options or significantly changing economic incentives (Thaler & Sunstein, 2021) — but not every digital stimulus is a nudge (e.g., monetary incentives)

Two Big Challenges to Real-World Engagement

- Information overload — the digital world delivers info faster than people can process it, causing rushed or absent responses

- Contextual competition — multiple real-world demands compete for attention, and conditions shift quickly

- Together, these set up the need for a framework built around in-the-moment, impulsive decision-making

The AIM-ACT Framework

Borrowing From Neuroscience: The AIM Framework

- People respond to a stimulus in three stages:
  - Affect → Initial emotional reaction
  - Integration → Weighing benefits and costs
  - Motivation → Desire to act or not act
- Provides a framework for understanding engagement

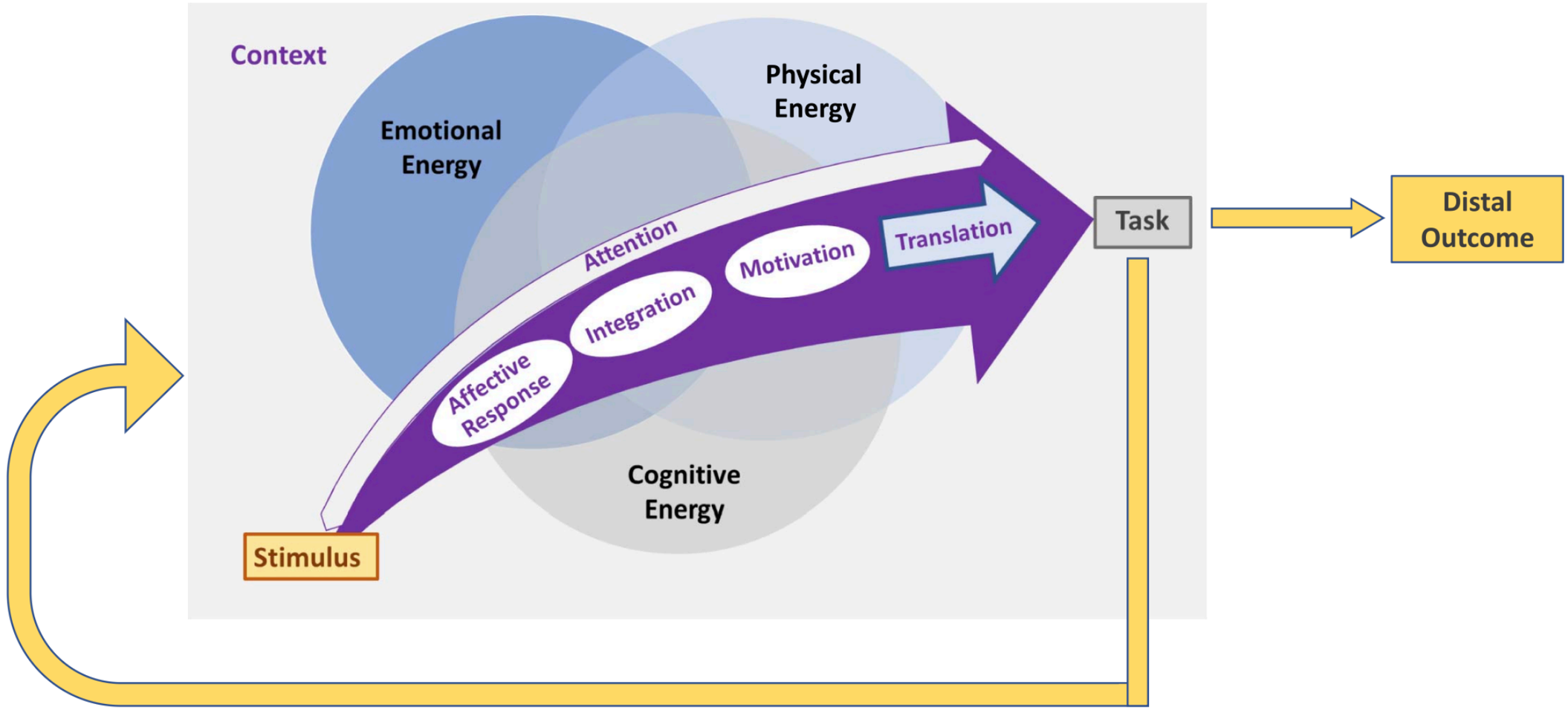
Extending AIM to AIM-ACT

- AIM explains how motivation develops
- Three additional elements:
  - Attention – Did the person notice the stimulus?
  - Context – What is happening around them?
  - Translation – Does motivation become behavior?

The Full AIM-ACT Framework

Figure 1

AIM–ACT: Conceptual Framework of in-the-Moment Engagement in Digital Interventions



Note. AIM–ACT = affect–integration–motivation and attention–context–translation framework. See the online article for the color version of this figure.

Walking It Through: An Example

1. Notification suggests a walk
2. User evaluates the suggestion
3. Context influences the decision
4. User chooses whether to walk
5. New events may change the outcome

Engagement Over Time

- Past experiences shape future engagement — a good walk yesterday makes John more receptive to tomorrow's prompt

- Habituation can set in — repeated exposure to the same stimulus produces a weaker response over time, so novelty may be needed

- Once a behavior becomes habitual, it needs less engagement — it's cued automatically, without consciously processing the stimulus

A Limitation of the Framework

- Addictive behaviors may not follow the same process
- Reward signals can dominate decision-making
- Important consideration for intervention design

Design Implications

- **To improve engagement:**
  - Capture attention
  - Personalize messages
  - Deliver support at the right time
  - Consider context
  - Reduce barriers to action

Challenges and Future Directions

- **Challenges:**
  - Measuring attention
  - Measuring motivation
  - Capturing engagement in real-world settings
- **Future Direction:**
  - Microrandomized trials

Thank you for your attention