The Art & Science of Engagement

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mad*pow

en·gage·ment

Engagement is a universal goal in the design of any content, service, system or product. We all need some level of interaction with our audience to achieve our desired outcomes (or help people achieve theirs) regardless of our business or mission. Despite engagement's pervasive appeal and our desire to get as much of it as we can, the concept itself has proven difficult to precisely define and design for. We just know we want it, we aren't getting enough of it, and we need to do something about it. But before we can know if we're "getting engagement right", we need to be clear on exactly what it is and potentially why we want so much of it.

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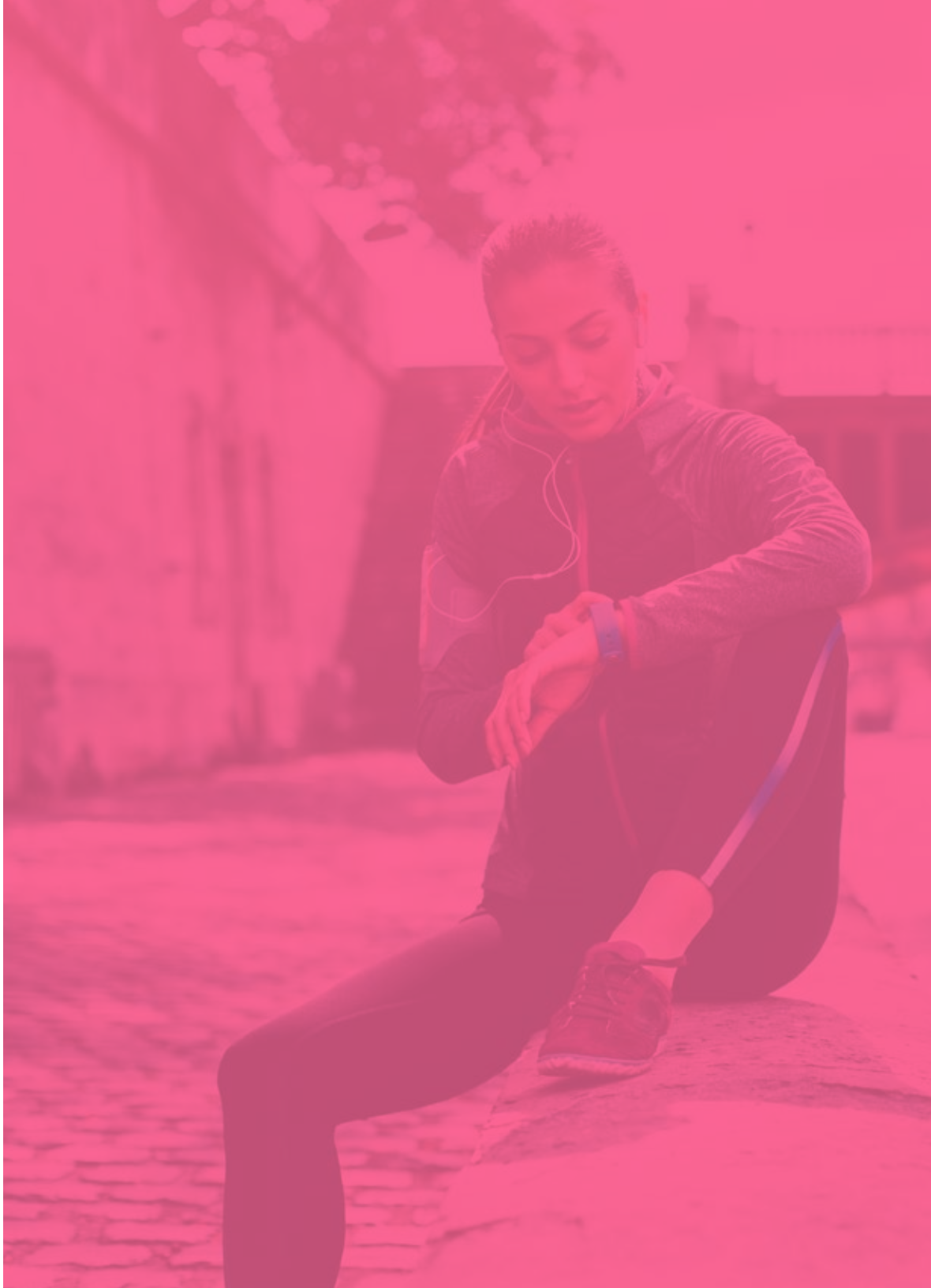


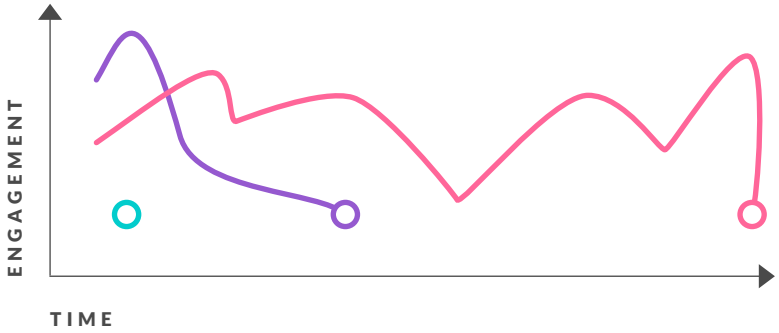
Knowing who is engaging, how, and if users are reaching intended outcomes is critical to successful intervention design.

It has been said that for many digital interventions three kinds of engagement patterns emerge:

- Some users will use it once and never return.
- Some will use it intently for a period of time but quickly drop off.
- Some will use it in unexpected ways.

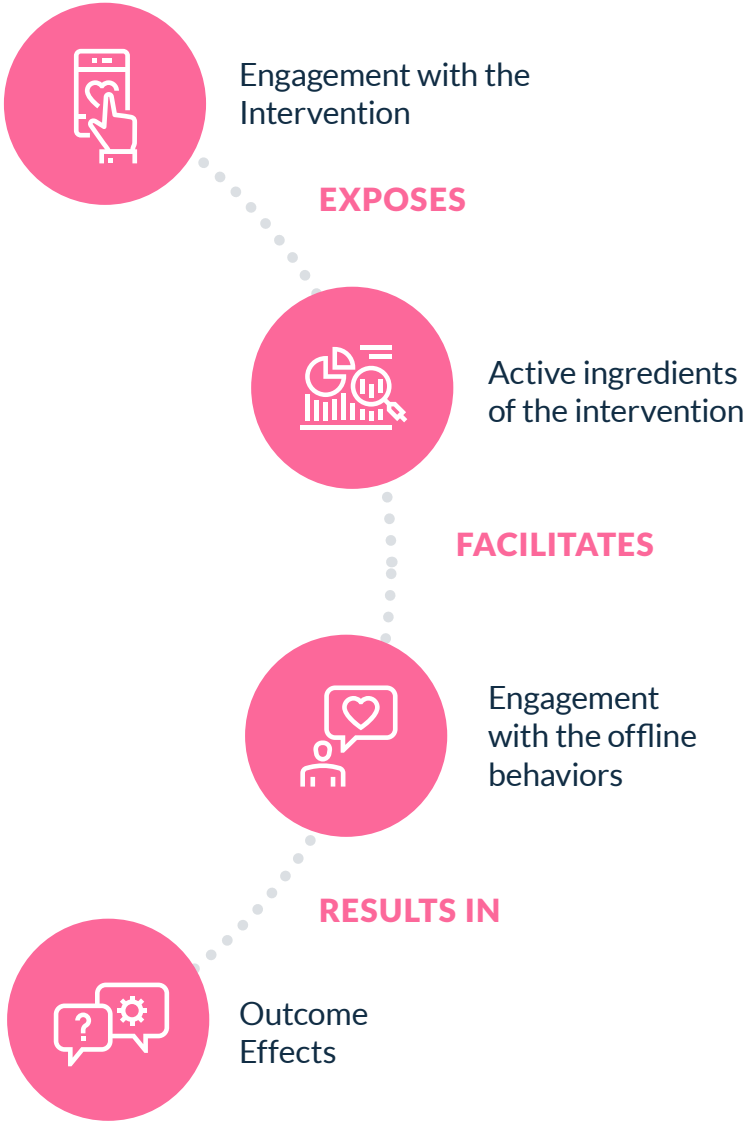
What is engagement?

Research stemming from multiple disciplines have offered a variety of definitions and conceptual models of engagement with little consensus between them. This has made it difficult to put research into practice in a meaningful way. However, a new consolidated definition of engagement has been recently proposed by behavioral scientists studying digital health that we find immensely useful in our intervention design work. Engagement as described by Perski et al (2016), consists of both a behavioral component (to what extent is something being done) and an experiential component (characterized specifically by attention, interest, and affect). These constructs capture the behavioral, cognitive, and emotional aspects of engagement previously fragmented across the scientific literature. Additionally, engagement itself is hypothesized to be influenced by the form, format, and tonal qualities of the artifacts or media we interact with, as well as our immediate surroundings (e.g., at home, work, or in the check-out line; alone or with others) and individual characteristics (e.g., motivation, expectations). With this in mind, we can classify engagement as a dynamic state that emerges as a result of a person interacting with their environment, and the objects and agents within it, over time.



Why do we focus on engagement?

It can be so easy to get lost in the quest for sign-ups, log-ins, clicks, likes, and shares that we lose sight of why we want people to engage with technology in the first place. At Mad*Pow, we design for behavior change. That is to say, the products and services (i.e., interventions) we develop are intended to change peoples' behaviors **in the real world**. These behavioral changes, in turn, are linked and lead to the broader outcomes we're aiming to achieve. For example, we might be aiming to reduce heart attacks or cardiovascular disease complications through helping patients manage and improve their blood pressure with a mobile app, smart watch or activity monitor, and connected blood pressure cuff. The **real-world target behaviors** we're looking to change might be daily monitoring of blood-pressure with connected cuff, adhering to medication as prescribed, increasing physical activity, making dietary changes (DASH diet), and making/keeping MD appointments. The **in-app digital actions** we want people to take might be viewing blood pressure readings, setting physical activity targets, logging food consumed (to check sodium and potassium intake), reading informational content about hypertension and heart-disease, the role of lifestyle changes, medication, and medical staff support, and interacting with push notifications providing motivational support, general tips and advice, links to healthy recipes, and short "test your knowledge" quizzes. In this structure, the real-world behaviors support achieving our health outcomes, and the digital actions support the execution of the real-world behaviors by providing goals to strive for, informational, motivational, and educational content, tools for tracking behavior and outcomes, and progress feedback and visualizations.



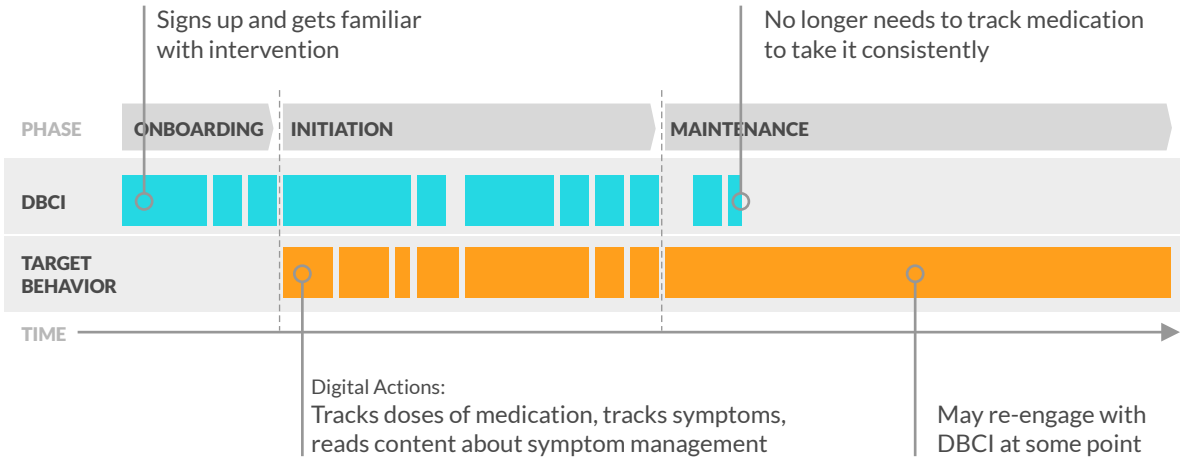
How much is enough?

In our hypertension intervention above, each of the real-world target behaviors and corresponding digital actions has a **cadence of performance** associated with them. For instance, we might recommend measuring blood pressure twice a day for the first week of the intervention, and then twice a day for a week during each month of the intervention, increasing physical activity might seek to hit US guidelines for moderate to vigorous activity as appropriate by age group. App usage for tracking and self-monitoring of BP, activity, and food intake would map to real-world behaviors, and content consumption might aim for 2-3 completed interactions per week for the first 6-weeks and on an 'as needed' basis after that (using tracked behavioral data and a rules engine to determine frequency of prompts and content topics). Determining the appropriate cadence for each target behavior and digital action should be planned during the early stages of intervention design and informed by primary and secondary research. It should be noted however, that when evaluating appropriate dosing, guidelines for target behaviors are likely to be found through an evidence review (and may need to vary or adapt over time based on individual-level characteristics, contexts, and engagement). Less evidence is currently available to support decision making on required or recommended usage of the digital technology although the body of knowledge is growing. Making informed decisions for digital usage is best guided by what evidence might be found for similar interventions, populations, and contexts, and via systematic assessments throughout the development life cycle to test and refine hypotheses about how much engagement with what content and features, over what period of time is feasible and needed to achieve desired outcomes. Understanding the degree to which a person must engage with an intervention in order to adequately change behavior is an important concept in designing digital interventions and has come to be known as "effective engagement" in the behavioral sciences (Yardley et al. 2017). The concept of **effective engagement** challenges the notion that intensive amounts of engagement are required for outcomes to occur or that "more engagement" is always a noble goal. We believe in striving to design interventions that can provide enough exposure to behavior change techniques (BCTs) while minimizing user burden, fatigue, and attrition.

Designing effective engagement

Sample: Rheumatoid arthritis

Target behaviors: Adheres to medication regimen



Hypothetical effective engagement pattern for rheumatoid arthritis intervention. Adapted from Yardley et al 2016.

How can we influence engagement through design?

By now, it should be clear that intervention usage and efficacy are intently linked. Interventions need to be used in order to be effective. Any design process needs to address both what is most likely to change behavior (in terms of intervention functions and behavior change techniques) and what strategies can aid sufficient engagement with the target behaviors and digital actions to affect outcome achievement. The process for design should follow an iterative approach, using mixed-methods research to progressively refine and adapt the intervention to meet user requirements and improve engagement and outcomes. When it comes to zeroing in on engagement, a number of strategies can be applied.

The first design element to carefully consider regarding its effect on engagement is the overarching **structure** of the intervention. Generally speaking, interventions can organize the progression and flow of content in one of the following ways: The first is highly structured or **sequenced** use with content and recommended actions arranged in a step-wise succession with content objects becoming available as a previous one is completed. Highly structured interventions often take shape as modules or lessons to be completed and are deployed when there is a lot of educational content or skills-building activities needed as part of the intervention, such as in a Diabetes prevention or management program.

The next potential intervention structure is described as "open-ended' or "free-range use" and consists of content and features that people can engage with at their own convenience. **Free-range** interventions may contain some level of recommended guidance or prioritization of content and features for users to engage with and may use application data to match the relevance of suggested and prioritized content or tools to user needs or preferences.

Hybrid interventions can capitalize on the strengths of both approaches above by having a fixed core of content and activities to engage with and a range of supplemental features and content for individuals to self-select and use at-will. This can help ensure that the most potent ingredients for changing behavior from a theoretical or evidence-base are optimized for engagement and that users still have the opportunity and choice to interact with content they perceive most fits their needs.

For each of the above, consideration and validation of which content objects directly influence behavior change and which potentially serve a more digital engagement focus can help teams ensure that they indeed have 'active ingredients' and balance those elements with 'stickier' engagement focused features.

Another overarching structural design pattern followed is known as a **Just In Time Adaptive Intervention (JITAI)**. JITAIs use data collected from sensors in a smartphone, wearable device, or other sources to deliver support "Just-in-Time" or as close in time to events, situations, or moments when an individual is likely to be in need or most receptive to support (Naughton, 2016, 2017). JITAI behavioral techniques may require a training period where a user reports on metrics that matters in real-time (such as when and where they smoke along with psychological or environmental triggers) to train the system on a user's daily patterns to then deliver a contextually-relevant strategy (such as a notification showing the user the number of days they've been smoke free, when they enter a geocache zone previously associated with smoking). In this regard, JITAIs require little user burden after an initial training period while still providing relevant exposure to behavior change techniques.

We also think about the type of content contained in each of the above structures. How much of the intervention relies on **interactive content** such as self-reported data logging, quizzes or assessments, interactive features requiring manual interaction such as data entry or object manipulation, or messaging and **passive content** such

as reading, listening to audio, or watching a video. Different user segments may prefer one type of content consumption over another and striking a balance may help to retain users for longer durations as they engage in ways they most prefer.

Tailoring intervention content and functionality to match user characteristics and engagement patterns is another strategy that has great impact on both experiential and behavioral aspects of engagement. When interventions provide customized experiences, they are more likely to be (or perceived to be) personally relevant, matched to skills, abilities, and needs, and therefore more interesting, useful, attainable, and engaged with as compared to generic 'one-size-fits-all' approaches (Diijkstra 2012, Ryan 2019).

Digital experiences are full of feedback and **feedback loops** that guide our actions from the simplest state changes, to notification/email outreach logic, to complex tailoring algorithms.

Perhaps the most frequently used pattern in all digital intervention design is the combination of self-monitoring of behavior or other metrics and timely feedback comparing the metric to a standard, personal goal target or previous reading. These feedback loops provide people with real-time information about something they (hopefully) care about, giving them the chance to make changes and move towards a more desired standard or outcome. When thinking about feedback loops and engagement, details make the difference. Making sure that feedback is relevant, timely, relatable, and actionable is essential for promoting engagement. In other words, is the informational feedback something the person cares about? Did they receive the feedback output as close to the input timing as possible (to make a tight association)? Can they make sense of it and relate it to a comparator to evaluate if they are doing the same, 'better', or 'worse'? Will they know what kind of action to take to change a future result, if they choose to?

In addition to control theory style feedback loops, designing **(re) engagement loops** using notifications, text or in-app messaging, emails, or other channels to deliver timely new information, questions or short assessments, relevant task suggestions, or reminders between sessions prompting individuals to re-engage with the intervention is another critical component of any engagement strategy that needs to be well-crafted and evaluated.

The overall usage requirements or **burden of use** of an intervention needs to be carefully examined during the design process as well. "Maximum benefit with minimum burden" is, of course, an ideal principle to aim towards and takes true work and perseverance for design teams to get to.

Temporally mapping the intervention to illustrate the number of real-world target behaviors expected to be performed, when they might occur over the course of the intervention and during a 24-hour period, as well as the average time the behaviors might take to execute. The same should be done for the digital actions. How much content do users need to interact with or consume over the duration of the intervention? How long do we expect them to engage in order to reap benefits? How many sessions per week, per day? How long does a typical session last? Do the durations differ between onboarding period, initiation of change, ongoing engagement, re-engagement? Mapping the expected or possible engagement patterns can help teams assess exactly what we are asking beneficiaries to do, so we can be more astute about fitting the intervention into people's lives and targeting "just enough engagement to reach meaningful outcomes".

Fostering **Social connectedness** as part of an intervention is an intuitive strategy for promoting both engagement and efficacy but should be carefully assessed as it does not always produce beneficial effects and in some cases may be detrimental to engagement or outcomes. Formative research with potential users, careful monitoring and regulation, and a clear rationale for including social features can help to minimize detrimental effects like conflicts between users, feeling 'obligated' to participated, perceptions of inauthenticity, and low-to-no-participation in social

features. Implementation can take several forms. At the lowest level, **social presence**, or an awareness that others are using the intervention as a whole or its individual components can help to maintain usage. This is typically achieved via displaying the number of likes, favorites, shares, completes, etc. a content object gets. Two-way **social interaction** such as messaging, commenting, sharing, and user generated content in forums, feeds, or community areas can be an effective engagement strategy in the right contexts but can also backfire and take time to establish. **Collaboration or accountability** models often used in workplace wellness interventions like team challenges or buddy systems are a mixed-bag in terms of fostering effective engagement. In these models, collaborative goal achievement can be influential for short-term compliance but can hamper repeat and sustained engagement with programs and beneficial behaviors.

Most benefits from technology-mediated social interactions come from genuine emotional and practical support from peers, professionals, friends and family. **Social support** stemming from interactions with strangers (i.e, weak-ties) can provide benefits for groups facing psychosocial stressors like stigma and chronic illness. Individuals may gravitate towards active engagement (e.g., posting) or passive engagement (e.g., "lurking") with retention and efficacy effects evident for either though potentially greater for more active users (Brown et al 2003). When it comes to interacting with personal networks (i.e, close-ties), benefits come from participation in medical decision-making (e.g., interacting with clinicians or care team), expressing treatment preferences, receiving emotional support, or emotional and practical support in terms of personalized coaching. Digital interventions plus human coaching appears to be an effective model, typically outperforming digital only versions of the same intervention (Sweet 2018).

Another intuitive and frequently used strategy to jump-start and maintain engagement with behavior change interventions is to offer **incentives** in the form of tangible goods such as prizes and cold-hard cash or discounts, reduced premiums, time-off or other personal benefits for enrollment, participation, goal attainment, or discreet behaviors like taking an assessment or logging data. Although the use of incentives has been shown to boost short-term engagement and behavioral change in a variety of domains, these strategies have drawbacks that limit their impact on long-term engagement, behavioral change, and outcomes. First, their actual effects on reducing behavioral risk factors or improving outcomes have been modest at best (Cawley et al 2013; Finkelstein et al 2007). Second, there is evidence that in some cases external rewards could fail to enhance or even displace an individual's autonomous motivation to engage in a behavior (Gneezy et al 2011; Moller et al 2012). Third, in many incentive research studies behavior change that was achieved when incentives were offered was no longer sustained when incentives were removed (Kulgren et al 2013; Volpp 2006, 2009).

With the evidence pointing to potential risks associated with incenting engagement and behavior change, care should be taken to carefully evaluate the desired outcomes, contexts, target behaviors, and population characteristics before implementing incentive programs, introduce them incrementally, if at all, and study their true effects through randomized experimentation.

With the subjective experience of engagement characterized as attention, interest, and positive affect (e.g., enjoyment/fun), utilizing game design and **gamification** has become another popular strategy to motivate and engage individuals in the process of change. While the majority of reporting on the benefits of gamification falls firmly in the hype category, it has been shown to foster positive impacts on both subjective experience and behavior including linkages to positive outcomes in physical, mental, and financial health and well-being in a number of higher quality studies (DeSmet et al 2014; Allam et al 2015). At Mad*Pow, we've had good outcomes designing games to increase physical activity at work (Hotseat), improve financial literacy in new military recruits (cfpb's "Misadventures in

Money Management), increase uptake and completion of health risk assessments (Cigna), and improve adherence to physical therapy regimens (Reflexion Health). Each of these digital interventions had strong associations between sustained usage and outcomes with engagement being a critical component of success.

As with the other strategies above, the design process and details matter - not all experiences can or should be 'gamified.' We've had projects where we've discovered early in the process that a game was not the right approach for our target audience and could pivot efficiently and we've also had projects whereby **removing** game elements from an experience reduced distraction, increased user satisfaction, and improved overall retention.

Additionally, it should be pointed out that overlap exists in mechanisms that are hypothesized to influence engagement between the broad strategies above and the strategies might be employed together in an intervention making it hard to tease apart the exact effective elements. For example, digital rewards such as points and badges used in gamification may function similarly to tangible incentives, both sequenced or free-range interventions might use tailoring techniques, a game could be effective due to scaffolding challenges, reducing burden of use or the social connectedness it facilitates through playing with others.

Finally, the elements of **user experience** have a definite impact of engagement. Usability, aesthetics, novelty, voice and tone, richness and depth at the very least can detract from the overall experience and engagement when not well executed and can enhance the experience, creating real value, delight, and endurability.

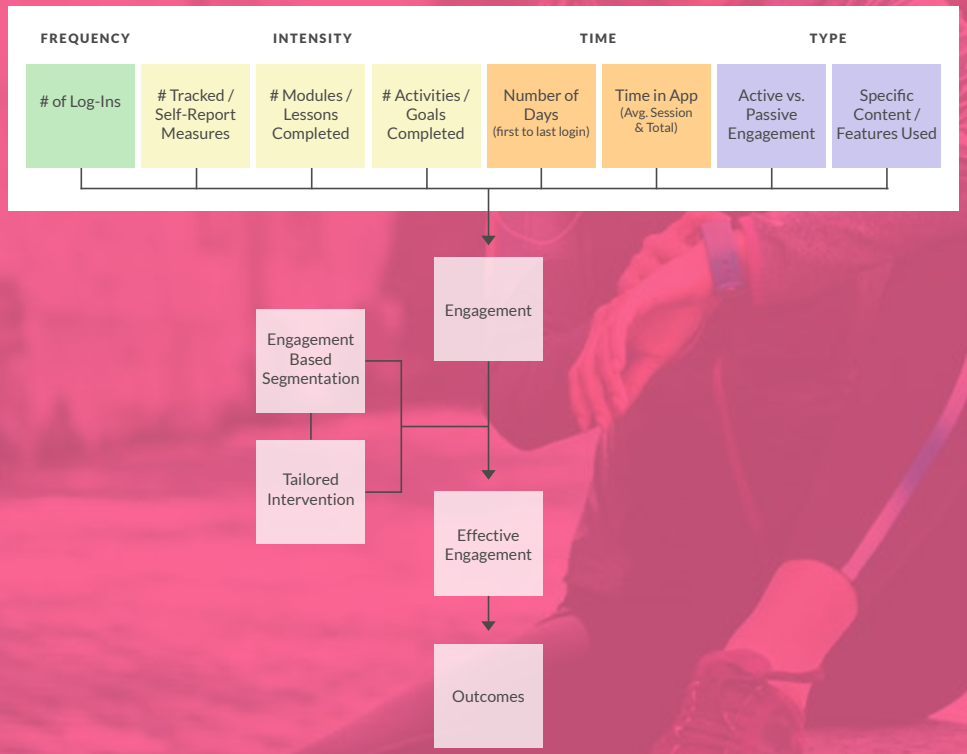
How do we measure engagement?

Since engagement is conceptualized as both subjective experience and objective behavior, we can use a mixed-methods approach to combine objective assessment of technology usage and behavior, with subjective reports of individuals' digital and offline experiences with the intervention. Ultimately, we're aiming to understand what content and features, with what usage, produce what effects for whom, so that the intervention can be scaled, adapted, optimized, iterated upon, or designed in the first place. Assessing engagement throughout the development life cycle from concept to prototype, to pilot to full-scale implementation can and should be a part of the design process.

In the concept stages before working software, we can still examine perceptions and reactions to the intervention to understand participants' feelings towards the intervention's outcome goals, the target behaviors, their perceptions on its potential burden of use, and their motives both for and against usage. At the lo-fi prototype stage, we can additionally test for usability issues, attention, interest, and enjoyment, perceived competence and outcome expectations. More refined prototypes can also test for aesthetic appeal, novelty, perceived (or actual) time in app, depth of use (amount of features used/available features). A useful testing method for 'working' prototypes is to allow participants to use them for a week 'in the wild' to capture objective usage data or self-report estimates of tech usage and experience and performance of target behaviors (through logging/diary study or other means to capture data). These methods of early engagement testing can be invaluable for guiding intervention and interaction design.

Engagement Indicators

Analytic indicators for measuring engagement. Based on Pham et 2018, Short et al 2018



Once intervention fidelity is robust enough to capture sensor or analytics package data (such as Google Analytics or Firebase), we can begin to analyze objective behavioral data. Since analytics packages can produce lots of data, we want to assess precisely which behavioral indicators are important to us. A useful way to categorize types of usage data and their potential effects on outcomes comes from physical activity research and uses the acronym FITT which stands for **Frequency, Intensity, Time,** and **Type** (Barisic et al 2011). Frequency provides information on how often a person visits a site, launches an app or uses a technology (e.g., number of log-ins). Intensity measures the **depth of engagement** with the intervention, for example, the number of self-report metrics tracked, content consumed, or modules/activities completed out of total available. Time is used as a measure of the **duration** of engagement during a single session or as a measure to assess the level of exposure as an aggregate over the intervention period, and as a measure of the intervention period itself (e.g., from first log-in to last log-in. Type refers to the kind of engagement such as "active" or "passive" and to capture the specific content and features utilized.

Examining subjective and objective engagement data as described above can provide greater insights into what intervention design elements might be most engaging to potential beneficiaries, how implemented interventions are being used compared to how design teams intended them to be used, identify or validate the effective dose-response ratio and active ingredients, segment users by engagement behaviors, tailor, refine, and optimize the intervention to maximize impact.

Looking ahead. At Mad*Pow, we're excited to be at the forefront of the application of engagement research to intervention design. We're hoping to change the collective understanding of engagement from a fuzzy, toothless buzzword to a tool for improving meaningful outcomes. As the evidence grows, we'll all be better equipped to link engagement to behavior change techniques and deliver outcomes that matter.

Objective & Subjective testing methods throughout the intervention design life cycle

CONCEPT /PRE-PROTOTYPE	EARLY PROTOTYPE	PILOTABLE MVP /HI-FIDELITY PROTOTYPE	BEYOND
Subjective Measures Interviews Think Aloud / Think After Questionnaires	**Subjective Measures** Interviews Think Aloud / Think After Questionnaires	**Objective Measures** Take Home Study Analytics / Usage Data Pilot Trial Analytics Sensor Data **Subjective Measures** Interviews Questionnaires Think Aloud / Think After EMA	**Objective Measures** Analytics / Usage Data Sensor Data **Subjective Measures** Interviews Questionnaires Think Aloud / Think After
Questionnaires ACTA (Peters, 2018) – Measures motivation to adopt technology, perceived competence	**Questionnaires** DBCI Engagement Scale (Perski, 2018) – Interest, Attention, Enjoyment, Amount, Depth TENS – Interface (Peters, 2018) - Measures BPNS.	**Questionnaires** TENS – Task (Peters, 2018) – Measures BPNS. **Analytic Measures** **Frequency** - # of Logins; # of self-track entries (day, week, total) **Amount** – Time Spent in App **Duration** - # Days, Weeks Used **Depth** - # of content pieces, features, modules, pages, consumed or completed.	**Questionnaires** User Motivation Inventory (Brühlmann, 2018) – Motivational Quality, Interest, Enjoyment **Analytic Measures** **Outcomes**

How can Mad*Pow help you optimize effective engagement?

We offer a variety of ways to partner with you:

Audit: We'll assess your current offering, identify or refine outcome measures, target behaviors and digital actions, current and intended engagement patterns, and provide recommendations for improvement grounded in theory, evidence, and experience.

Behavioral Research: Changing something effectively requires that you first understand it deeply. Our research focuses on diagnosing problems in behavioral terms and identifying the underpinning determinants to action or non-action in a systematic way so that the right strategies can be implemented to affect change.

Engagement strategy: We can partner with your teams to optimize your engagement so that it delivers the outcomes you are after.

Intervention Design: We combine scientific rigor and creativity ingenuity to design interventions that are evidence-based, engaging, and effective. From concept and strategy, to prototype, pilot, and scaled, we can partner with you to design, implement, and optimize your intervention at every step of the way.

Evaluation: Knowing if and what about your intervention is working and to what degree is a vital part of the behavior change design process. We use a range of study designs and analyses to evaluate user acceptance, engagement, and outcomes effectiveness.

Got questions about designing for effective engagement? We'd love to help.

Talk to us: engagement@madpow.com

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