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# Theoretical Frameworks for Behavioral, Social, and Health Changes via Digital Avatars

## Introduction

Digital avatars – virtual representations of users in games, social media, virtual reality (VR), and health applications – have become increasingly prevalent. As avatars mediate how individuals present themselves and interact in digital environments, researchers have developed theoretical frameworks to explain how avatar use can lead to changes in users' behavior, social interactions, and health-related outcomes. In the past decade, several peer-reviewed frameworks from psychology and public health (and related disciplines) have been proposed or refined to understand these phenomena. Below, we detail key frameworks, their core components and theoretical foundations, and examples of how each has been applied in avatar research. A summary table is provided at the end for quick reference.

## Social Cognitive Theory (Observational Learning)

**Theoretical Basis:** *Social Cognitive Theory* (SCT), originally by Bandura, posits that people learn behaviors by observing models and through vicarious reinforcement. In avatar contexts, SCT has been widely used to explain how seeing an avatar perform an action can influence the user's own behavior [1]. Key components of SCT include observational learning, imitation, self-efficacy, and outcome expectancies.

**Key Components:** When applied to avatars, SCT suggests the avatar can serve as a **behavioral model**. For example, an avatar demonstrating healthy behavior (like exercising or choosing healthy foods) can increase a user's confidence (self-efficacy) and knowledge about that behavior [1]. Users may imitate the avatar's actions, especially if they identify with the avatar or see the behavior rewarded. SCT also highlights **reinforcement**: if an avatar is depicted receiving positive outcomes for healthy behavior, the user may expect similar outcomes.

**Application in Avatar Research:** Many health intervention studies ground their design in SCT. For instance, Fox and Bailenson (2009) had participants watch a virtual avatar that resembled themselves exercise and lose weight; afterward, those participants exercised more in reality than those who saw an unrelated avatar [2]. Here the avatar served as a modeled example of exercise (observational learning) with vicarious reinforcement (the avatar's weight loss). Similarly, a systematic review found social cognitive principles frequently underpin avatar-based health programs – users learn healthy behaviors by observing a similar avatar performing the behavior successfully [1]. The SCT framework has been used to boost physical activity, improve diet choices, and other health changes by providing an avatar "role model" that users can emulate.

## The Proteus Effect (Self-Perception and Priming)

**Theoretical Basis:** The *Proteus Effect* is a prominent framework in avatar psychology introduced by Yee & Bailenson (2007). It refers to the phenomenon that users' behaviors tend to conform to their digital avatar's characteristics or appearance [3]. The theoretical foundation of the Proteus Effect lies in self-perception theory and related priming mechanisms. **Self-perception theory** (Bem, 1972) suggests that people infer their own attitudes and traits by observing their behaviors or external cues [4] [5]. In a virtual setting, an avatar's appearance or label is an external cue about the self; users might adopt behaviors consistent with that cue to maintain self-congruity [4]. Additionally, **priming theory** provides an alternative but complementary basis: merely perceiving certain traits or stereotypes associated with the avatar can automatically activate related behavior schemas in the user [6] [7].

**Key Components:** The core idea is that an avatar's attributes (e.g. attractiveness, height, professionalism, body size) can **shape the user's self-concept or mindset**, leading to behavior changes. For example, a user given a tall, confident-looking avatar may behave more assertively, whereas an avatar with a disheveled appearance might lead to more timid behavior. Two mechanisms often discussed are: (1) **Self-perception/ Identity shift** – the user observes "I am represented as X" and thus aligns their behavior with X, and (2) **Trait Priming** – the avatar's features cue associated behaviors (e.g. a business-suited avatar primes professional conduct). Both result in the user acting in accordance with the avatar's perceived traits [3] [7]. The Proteus Effect has been described as a form of *behavioral confirmation of one's avatar*.

**Application in Avatar Research:** This framework has been demonstrated in both laboratory and field studies. Classic examples include users in attractive avatars exhibiting greater friendliness or self-disclosure, and users in taller avatars negotiating more aggressively than those in shorter avatars (as if embodying the confidence of height). In health contexts, studies have shown that embodying a fit or active avatar can lead users to exercise more or adopt healthier habits, consistent with the avatar's image [3]. A review of health interventions using avatars found that many rely on the Proteus Effect: for instance, participants who saw an avatar that looked like them running on a treadmill later showed increased real-world physical activity [3] [6]. The Proteus Effect framework thus illustrates how simply changing one's *digital self-representation* can cause measurable shifts in behavior, via internalizing the avatar's attributes.

*Theoretical refinements:* In the past 10 years, researchers have further analyzed the Proteus Effect's psychological underpinnings. Some argue that the effect is a form of **perception-behavior consistency**, where seeing oneself as an avatar activates a relevant self-concept that then guides action [6]. Others have explored moderating factors (e.g. the degree of user identification with the avatar, or the context). A recent theoretical review identified multiple hypotheses for why the Proteus Effect occurs – including self-perception, priming, **deindividuation**, and **cognitive dissonance** – suggesting that several social-cognitive processes together may explain this phenomenon [5] [8]. (We discuss some of these related processes below, under separate frameworks like embodiment and social identity.)

## Self-Discrepancy Theory (Actual vs. Ideal Self)

**Theoretical Basis:** *Self-Discrepancy Theory* (Higgins, 1987) distinguishes between an individual's *actual self* (current self-concept), *ideal self* (aspirations of what one would like to be), and *ought self* (beliefs about who one should be). Discrepancies between these selves can motivate behavior change as people strive to reduce the gap between their actual self and ideal/ought standards. In the context of digital avatars, this

theory has been leveraged to understand how avatars representing different self-states might influence user motivation and behavior [9]. By visualizing an ideal or ought self through an avatar, users may experience either inspiration or discomfort that spurs them to change their real-world behavior to match the avatar. Conversely, using an avatar resembling one's actual self can highlight current qualities or risks, affecting attitudes and actions.

**Key Components:** An avatar can be designed to embody the user's *ideal self* (e.g. fitter, more confident, or otherwise improved version of the user), the *actual self* (a mirror of the user's current appearance/behavior), or even an *ought self* (emphasizing traits the user feels obligated to have). Self-discrepancy theory predicts distinct emotional and motivational outcomes from each. **Ideal-self avatars** might inspire approach-oriented motivation – the user sees a version of themselves with desired traits and is motivated to attain that state [10]. **Actual-self avatars**, by contrast, can serve as a reality check, potentially increasing awareness of current shortcomings or health risks, which may prompt preventative or corrective actions [11]. An **ought-self avatar** (reflecting who one thinks they should be) might evoke a sense of duty or obligation to change, especially if falling short of that representation causes discomfort.

**Application in Avatar Research:** Several recent studies explicitly used self-discrepancy theory as their framework [9]. For example, in one experiment participants created either an ideal-self avatar or a present-self avatar and then engaged in a health task. Those using an ideal-self avatar (one representing how they *wish* to look/behave) showed healthier eating behaviors and lower tendency to devalue future rewards compared to those with a present-self avatar [12]. The ideal avatar seemingly helped participants visualize a healthier future self, translating into better self-control in diet. Conversely, another study found that participants who created an avatar closely matching their actual current body felt a higher perception of health risk – seeing their real physique in avatar form made risks more salient – which in turn led to greater prevention-focused intentions (like avoiding unhealthy behaviors) [11]. Researchers have also explored *regulated self-concept activation*: one study activated either the actual or ideal self via avatar customization and found that different messaging (efficacy-focused vs. risk-focused) worked best depending on which self was activated, influencing healthy dieting intentions [13]. These applications illustrate how tailoring an avatar to a specific self-domain can be used as a psychological intervention tool. By either inspiring users with their ideal self or alerting them with their actual self, avatar-based strategies can encourage behavior change, consistent with self-discrepancy principles [9].

## Embodiment and Presence (Avatar Identification)

**Theoretical Basis:** *Embodiment* in virtual environments refers to the user's subjective feeling of being "in" their avatar's body – experiencing the avatar as an extension of oneself. This concept draws from theories of body representation and presence in cognitive psychology and communication. When a user has a high degree of embodiment, they not only observe an avatar but also feel agency (control) and ownership over the avatar's movements and form. A related concept is *self-presence* or *avatar identification*, which is the psychological connection between user and avatar at the identity level (feeling that the avatar reflects "who I am") [14] [15]. Theoretical work (e.g. by Ratan, 2012, and others) suggests that avatar use involves multiple layers of self-presence: one at the **body level** (physical incorporation) and one at the **identity level** (cognitive/emotional incorporation) [15]. High embodiment and identification are thought to facilitate behavioral effects because the user processes the avatar's experiences and attributes as if they were their own.

**Key Components:** Three commonly noted components of embodiment are **agency**, **body ownership**, and **location** (or self-location) in the virtual body [8]. Agency is the sense of controlling the avatar's actions; body ownership is the illusion that the avatar's body is one's own; and location refers to feeling spatially inside the avatar. When these are achieved, users report a strong sense of presence. **Avatar identification** is closely related but emphasizes identification with the avatar's identity or role (beyond just the physical body). The stronger the identification, the more the user may internalize the avatar's characteristics. Recent frameworks, such as Sah et al. (2021), describe identification and embodiment as outcomes of *cognitive fluency* – essentially, how easily a person can merge avatar-related information into their self-concept [14] [16]. If processing the avatar as "me" is fluent and effortless, the avatar-user bond is strong, leading to more pronounced psychological effects.

**Application in Avatar Research:** High embodiment has been shown to amplify avatar effects on behavior and attitudes. For instance, studies in VR found that when participants experienced a *strong sense of embodiment* in an avatar, they were more likely to exhibit behaviors aligned with that avatar's traits, consistent with the Proteus effect but specifically tied to the feeling of "being" the avatar [8]. One experiment demonstrated that embodying an avatar of Albert Einstein led users to perform better on cognitive tasks, presumably because the immersive embodiment made the avatar's intellectual persona feel like their own [5] [8]. In social and community contexts, greater embodiment can enhance social outcomes: for example, a recent study reported that in virtual reality, *embodying* a community-themed avatar (with both high agency and ownership) significantly increased users' sense of **belonging and commitment** to an online community [17]. This suggests that feeling physically and identity-wise connected to an avatar can strengthen social identification with groups or contexts represented by that avatar.

Avatar **identification** (the emotional/cognitive connection) has similarly been linked to behavior change. Users who strongly identify with their avatars tend to be more influenced by those avatars' experiences. In health games, identification with a fit avatar can increase motivation to exercise, and in educational settings, identifying with a learning avatar can boost engagement. The *Avatar-User Bond* framework by Sah et al. (2021) explicitly ties these ideas together, proposing that when identification (identity-level fluency) and embodiment (body-level fluency) are achieved, users readily incorporate the avatar into the self, making any avatar-driven feedback or behavior change more impactful [14] [16]. In summary, frameworks of embodiment and presence underscore that it's not just *what* an avatar looks like, but also *how deeply the user inhabits it*, that determines behavioral and psychological changes.

## Social Identity and Deindividuation Perspectives

**Theoretical Basis:** Beyond individual self-concepts, avatars also implicate social psychological frameworks. *Social identity theory* (Tajfel & Turner) suggests that people's behavior can shift depending on salient group identities, while **deindividuation** theory (e.g. Zimbardo's model, or the SIDE model in online contexts) proposes that anonymity or immersion in a role can reduce personal identity salience and lead one to conform to situational or group norms. When using avatars, especially those that mask one's real identity or represent a social category, these processes become relevant. An avatar can cue a particular social identity (such as a gender, ethnicity, profession, or fictional group), and users may internalize and act according to the norms or stereotypes of that identity [18]. Likewise, if the virtual environment obscures personal accountability (e.g. a user feels "masked" by the avatar), deindividuation might encourage behavior less constrained by the person's typical self – potentially resulting in either anti-normative behavior or greater conformity to the avatar's implied role.

**Key Components:** An avatar with salient group features can activate a **social identity** – for example, an avatar wearing a nurse's uniform might invoke a caregiver identity, or a fantasy guild avatar might invoke membership in that group. According to social identity theory, when such an identity is salient, the user's behavior may align more with group norms than personal preferences. **Deindividuation** aspects include anonymity, immersion, and reduced cues of one's individual identity, which together lower self-awareness and increase responsiveness to environmental or role cues. In avatar use, high immersion plus the avatar's distinct persona can create a *state of deindividuation* where the user takes on the avatar's character. Research has described this as shifting attention away from one's personal identity to the **situational norms associated with the avatar** [18].

**Application in Avatar Research:** One illustration of this framework is an experiment where participants embodied avatars associated with specific stereotypes or roles and then were observed on related behaviors. In a notable example, male participants who embodied a female avatar in VR showed increased empathy toward women and subsequently made efforts to counter gender stereotypes (for instance, putting more effort into a math task to disprove the stereotype that women are bad at math) [19] [20]. This result aligns with a *perspective-taking* interpretation (empathy from adopting another's identity) as well as social identity dynamics – temporarily adopting the identity of a different group can alter one's attitudes and behaviors towards that group.

On the negative side, deindividuation via avatars can sometimes lead to disinhibited or aggressive behavior, as seen in some online gaming or social platforms where users with anonymous avatars engage in toxicity more readily. However, theoretical frameworks like the Social Identity Model of Deindividuation Effects (SIDE) refine this: it's not random mayhem, but rather users conforming to what they perceive as the norms of the avatar's group or context. For instance, if an avatar belongs to a group where aggression is valued (say a warrior clan in a game), a deindividuated user may act more aggressively, whereas in a professional avatar they might become more courteous if that's the expected norm. Empirical studies have observed that when users put on avatars with certain uniforms or symbols, their actions tend to align with stereotypes of those uniforms (e.g. a study found that wearing a *Ku Klux Klan robe* avatar increased hostile attitudes, whereas a *doctor* avatar increased helping behavior, consistent with each role's social image – a classic demonstration of avatar-induced social identity effects). Thus, social identity and deindividuation frameworks help explain *social and behavioral changes* in avatar use by focusing on group norms, roles, and the loss (or shift) of self-awareness in virtual guise [18].

## General Learning Model (Media Effects Framework)

**Theoretical Basis:** The *General Learning Model* (GLM) is a framework from media psychology that extends earlier models (like the General Aggression Model) to describe how media experiences can instigate learning and behavior change. Buckley and Anderson (2006) introduced GLM to encompass both short-term and long-term effects of any media interaction on behavior, via changes in a person's internal state (cognition, affect, arousal) and the reinforcement of learned scripts. In the context of digital avatars, some researchers in the past decade have adopted GLM to conceptualize how interacting with an avatar could alter a user's internal state in ways that facilitate behavior change [21]. The GLM is not avatar-specific, but it provides a broad scaffold for understanding *avatars as stimuli* within a learning and behavior-change process.

**Key Components:** Under GLM, behavior change is a function of how personal factors (e.g. user traits, past experiences) and environmental factors (e.g. the virtual context, the avatar's characteristics) influence the

individual's internal state during the interaction [21]. Internal state includes **cognitive** (thoughts, perceptions), **affective** (mood, feelings), and **arousal** components. With avatars, one can consider the avatar's appearance or behavior as part of the *environmental factors*, and the user's predispositions as personal factors. The interaction with the avatar might change the user's internal state – for example, seeing one's avatar succeed could boost self-efficacy (cognition) and positive affect, which in turn increases the likelihood of the user adopting the behavior that the avatar performed. The GLM also highlights **feedback loops** and reinforcement: repeated interactions can solidify new knowledge or attitudes.

**Application in Avatar Research:** In health and education studies involving avatars, GLM has been used as an overarching framework to justify outcome changes. For instance, two health intervention studies reviewed in 2021 explicitly cited GLM: they treated the avatar exposure as an *experimental factor* that alters participants' internal states, leading to changes in health behavior [21]. Concretely, an avatar demonstrating healthy habits might simultaneously provide information (cognitive factor), evoke motivation or concern (affective factor), and engage the user's attention (arousal), thereby teaching the user and prompting behavioral enactment. Over time, these repeated avatar interactions could help *learn* healthier behaviors. GLM has also been applied to exergaming (exercise videogames with avatars), explaining how playing with a personalized avatar could yield learning of fitness habits or skills. While not as specific as other frameworks, GLM's strength is in integrating multiple influences – acknowledging that avatars can function as one of many influences on internal states that drive behavior. It encourages researchers to measure mediators like changes in thoughts (e.g. "exercise is enjoyable") or feelings (e.g. inspiration) when an avatar is present, to fully capture how avatar use translates into behavior change [21]. In summary, GLM provides a comprehensive perspective that situates avatar-induced change within general media-driven learning processes, bridging psychology and broader communication theory in an avatar context.

## Integrated and Interdisciplinary Frameworks

As avatar research matures, scholars have begun to integrate multiple theories into unified frameworks, often crossing disciplinary lines. Two notable examples from the past few years include an *integrative cognitive framework* for avatar effects and a *consumer-avatar journey* model, each drawing on psychology and other fields:

- **Avatar-User Bond via Cognitive Fluency:** Sah, Rheu, & Ratan (2021) proposed a theoretical framework to reconcile the perceptual (Proteus effect) and trait priming perspectives by introducing **meta-cognitive experience** as the key. They argue that when using an avatar, the critical factor is *cognitive fluency* – the ease with which one can process the avatar as part of the self [22] [14]. In their model, avatar **identification** is reconceptualized as the fluent processing of identity-related cues (e.g. traits, backstory of the avatar) and **embodiment** as fluent control of the avatar's body [14] [16]. If both identity-level and body-level processing are fluent, the user experiences a strong avatar-user bond. This bond then produces avatar effects on behavior and attitudes. Essentially, the framework suggests the more naturally an avatar "fits" one's self-perception (or the quicker one adapts to it), the more powerful its influence. This interdisciplinary approach merges social cognition with human-computer interaction, and has been discussed in the *Frontiers in Psychology* context as a way to explain mixed findings in Proteus effect research [22] [15]. While relatively new, this framework has implications for avatar design – e.g. to promote positive change, design avatars that users can easily identify with and control (maximizing cognitive fluency). It highlights the importance of user experience (a concept from HCI) in psychological outcomes.

- **Consumer-Avatar Journey Framework:** Bridging marketing, psychology, and virtual reality, Peng et al. (2024) developed a comprehensive framework to map how avatars influence consumer behavior and experiences over time. They identify three chronological phases in the *"consumer-avatar journey"*: **Self Representation**, **Avatar Embodiment**, and **Avatar-Mediated Interactions** [23]. In the self representation phase, a user (consumer) creates or selects an avatar based on motivations and self-concept (drawing on theories of motivation and self-discrepancy). Next, during avatar embodiment, the user comes to identify with and feel presence in the avatar (drawing on identification and presence theories). Finally, in the avatar-mediated interaction phase, the user engages with others or the environment through the avatar, leading to outcomes in evaluations, social behavior, or performance. A key proposition of this framework is that **sense of presence** (particularly self-presence and social presence) serves as a mediator between avatar use and outcomes – essentially, once the user *truly feels present* in the avatar, that avatar can influence their psychological state and behaviors in the virtual (and even physical) domain [24]. The framework integrates multiple theoretical perspectives (motivation theories, self-concept, identity, and presence) to explain avatar effects [25]. For example, it cites that consumers often design avatars to reflect an ideal or extended self (motivation & self-concept theories) and that *avatar identification formed after embodiment* can drive behaviors like purchasing virtual goods or building social connections [26] [24]. Although developed in a marketing context (e.g. understanding why gamers buy items for their avatars or how brand engagement works in the metaverse), the framework is interdisciplinary: it has relevance to any scenario where a user goes from creating an avatar to experiencing outcomes via that avatar. It underscores that avatar-based change is a process – starting from personal motives and ending in observable behavior – moderated by technology (e.g. realism, immersion) and social factors [25]. This kind of integrative framework is valuable for researchers and practitioners to systematically consider all stages of avatar use and leverage multiple theories when designing interventions or experiences.

In sum, the last decade has seen a move toward *holistic frameworks* that incorporate elements from psychology (identity, motivation, cognition), communication (media effects, presence), and domain-specific theories (health behavior, consumer behavior). These integrated models, such as the cognitive fluency approach and the consumer-avatar journey, provide comprehensive lenses through which to analyze avatar-related behavioral, social, and health changes. They complement the more focused theories described earlier, offering a multi-faceted understanding suitable for complex real-world applications (from improving health outcomes with avatar coaches to enhancing social connectedness in the metaverse).

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**Summary Table: Theoretical Frameworks on Avatars and Behavior Change**

| Framework | Discipline/ Origin | Core Concepts | Example Applications |
|---|---|---|---|
| **Social Cognitive Theory (SCT)** | Psychology / Public Health | Observational learning, modeling, self-efficacy; avatars act as role models that users can imitate [1]. Users learn behaviors by watching avatar rewards/ consequences. | Exergame avatars demonstrating exercise improved users' exercise self-efficacy and activity levels [2]. Health apps use avatar coaches to model healthy eating, boosting users' confidence to change diet. |

| Framework | Discipline/ Origin | Core Concepts | Example Applications |
|---|---|---|---|
| **Proteus Effect** <br>*(Self-Perception & Priming)* | Psychology / Communication | Users behave in accordance with their avatar's perceived traits [3]. Seeing oneself as an avatar with certain attributes (e.g. powerful, obese, attractive) activates matching behaviors via self-perception or automatic trait priming [6]. | In VR, people given a tall, authoritative avatar negotiated more aggressively than those in shorter avatars. In a diet intervention, users with fit avatars made healthier food choices, embodying the avatar's healthy persona [3]. |
| **Self-Discrepancy Theory** <br>*(Actual vs. Ideal Self Avatars)* | Psychology | Actual-self, Ideal-self, Ought-self domains of identity [9]. Avatars reflecting one's ideal self can inspire goal pursuit, while avatars of one's actual self highlight current state and risks [11]. Reducing self-discrepancy via avatars can motivate behavior change. | An *ideal-body* avatar increased users' motivation for exercise and self-control in eating (striving to become that ideal) [12]. An *actual-self* avatar of one's current body raised health risk awareness, leading to more preventive behaviors (to improve the real self) [11]. |
| **Embodiment & Presence** <br>*(Avatar Identification)* | Psychology / Cognitive Science | Feeling of owning and controlling the avatar's body (agency, body ownership) and seeing the avatar as "self" [8]. High self-presence/ identification means avatar experiences are integrated into one's self-concept [15]. Strong embodiment amplifies avatar's influence on attitudes and behavior. | In an empathy study, embodying a different-race avatar led users to internalize that perspective, reducing biased attitudes. In a fitness game, users who strongly identified with their active avatar (high presence) showed greater real-world exercise increase than those with low identification. Social VR finds that embodiment (agency + ownership) in avatars heightens users' sense of community and belonging [17]. |

| Framework | Discipline/ Origin | Core Concepts | Example Applications |
|---|---|---|---|
| **Social Identity & Deindividuation** | Social Psychology | Avatars can cue group identities or roles; users may conform to the norms of the avatar's group or stereotype [18]. Anonymity and immersion (deindividuation) reduce personal inhibitions, allowing behavior to shift toward situational cues. | Players using avatars dressed as villains vs. heroes exhibit more hostile vs. altruistic actions in line with those roles. Embodying an out-group avatar (e.g. different gender) increased empathy and led users to counteract stereotypes in behavior [19]. Online, anonymous avatars sometimes foster toxic comments – a deindividuation effect – unless pro-social group norms are salient. |
| **General Learning Model (GLM)** | Media Psychology | A broad framework where personal factors and avatar/environment features influence the user's internal state (cognitions, emotions), which then drives behavior [21]. Avatars serve as stimuli that can teach or reinforce behaviors through feedback loops. | Used to design serious games: e.g., a health game treats the avatar's feedback as an environmental stimulus that increases the user's knowledge and self-efficacy (internal state), leading to behavior change [21]. Also applied in studies showing that repeated avatar interactions (practice) help users "learn" and retain new healthy habits. |

| Framework | Discipline/ Origin | Core Concepts | Example Applications |
|---|---|---|---|
| **Integrated Frameworks** <br>*(e.g. Cognitive Fluency, Consumer-Avatar Journey)* | Interdisciplinary (Psychology + HCI + Marketing) | Combine multiple theories to explain avatar effects holistically. *Cognitive Fluency Model:* Avatar identification and embodiment as outcomes of easy self–avatar integration [14]. *Consumer-Avatar Journey:* Three phases – self-representation (avatar creation driven by self & motives), embodiment (identification and presence), and interaction outcomes – moderated by tech and social factors [25]. | *Cognitive fluency:* suggests designing avatars that align with users (easy to identify with) to maximize impact [14]. *Consumer-avatar journey:* applied in marketing to guide metaverse customer engagement – e.g. companies foster avatar customization (tapping ideal selves), then increase immersion (presence) to encourage purchasing and social sharing [25]. Similarly, health interventions might use this journey: let users create a health avatar (self-representation), build identification through small successes, and then leverage that in group fitness challenges (avatar-mediated interaction). |

Each of these frameworks offers a lens on how digital avatars can shape human behavior, social dynamics, or health outcomes. From observational learning and self-concept shifts to embodiment illusions and identity priming, the theories converge on a central insight: **our digital selves can influence our real selves**. By understanding these theoretical frameworks, researchers and practitioners can better design and evaluate avatar-based interventions – whether to promote healthy behavior change, improve educational and social experiences, or simply predict how the burgeoning use of avatars (in gaming, social media, and the metaverse) will impact individuals and society. The above frameworks (largely emerging or evidenced in the last decade) provide a foundation for rigorous, theory-driven exploration of avatars' role in behavioral and social change.

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