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**Author(s):** Hagger, Martin S.

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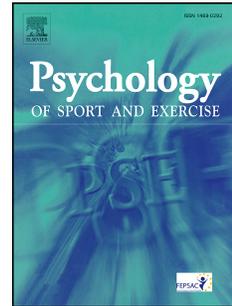
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Martin S. Hagger



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Redefining Habits and Linking Habits with Other Implicit Processes

Martin S. Hagger

University of California, Merced and University of Jyväskylä

Author Note

Martin S. Hagger, Psychological Sciences, University of California, Merced, USA and Faculty of Sport and Health Sciences, University of Jyväskylä, Jyväskylä, Finland.

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Correspondence concerning this article should be addressed to Martin S. Hagger, SHARPP Lab, Psychological Sciences, University of California, Merced, 5200 North Lake Road, Merced, CA 95343, USA. Email: mhagger@ucmerced.edu

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### Abstract

In their commentaries on Hagger (2019), Gardner, Rebar, and Lally (2019) and Phillips (2019) provide welcome debate on the conceptualization and operation of habits in physical activity. In this response, I extend their comments by (i) calling for a redefining of habits to encompass contemporary views of habit, and (ii) suggesting that descriptions of physical activity habits should make reference to their relations with other implicit constructs that reflect automatic processes. Specifically, I contend that extant definitions of habits for complex behaviors like physical activity should move away from definitions of unitary responses to specific cues or contexts, and, focus on ‘macro’ expressions of the behavior that comprise multiple sub-actions, which can each be controlled by habitual or deliberative processing. It may also be useful for definitions to make the distinction between habitual instigation and execution, affording greater precision in descriptions of the processes that generate habitual behaviors. Finally, physical activity habits as cue-action relations are unlikely to be enacted in the absence of activation of other implicit processes, consistent with behavioral schema. Recognizing this, I contend that descriptions of habit should accommodate these links, and that they may be useful in elaborating on the processes by which habits determine subsequent physical activity behavior.

Keywords: behavioral automaticity; habitual behaviors; automatic processes; dual-process theories; behavioral schema

## Redefining Habits and Linking Habits with Other Implicit Processes

Phillips' (2019) and Gardner, Rebar, and Lally's (2019) commentaries on my review of habits in physical activity (Hagger, 2019) have provided welcome debate on the definitions and operationalization of key concepts and mechanisms relevant to understanding habitual behaviors in this domain. Common to both commentaries is the importance of clarifying the defining characteristics of habit (e.g., viewing habits as a construct or behavioral impulse, defining habitual actions as a hierarchy of higher- and lower-order actions and sub-actions), and the distinction between different types of habitual acting (e.g., habitual instigation and execution). Related to these points, both authors challenge the view of strictly characterizing habitual behaviors as an exclusively automatic process, and suggest that habits for complex behaviors like physical activity often comprise blends of sub-actions, some of which are controlled by non-conscious, automatic processes, and others controlled by reasoned, deliberative processes, consistent with contemporary views of action derived from dual process models. In this response I contribute to this debate by (i) suggesting that definitions of habits should be revised to reflect the relativist view of complex habitual behaviors as blends of sub-actions each under deliberative or habitual control; and, (ii) proposing that descriptions of physical activity habits should make reference to relations of habits with constructs that reflect other automatic, non-conscious processes that determine behavior, and call for research that explores the extent to which these analogs of automatic processes coincide.

**Redefining Definitions of Habits**

A key issue emerging from contemporary research on habits in the physical activity domain, which was also lucidly highlighted in the commentaries (Gardner et al., 2019; Phillips, 2019), is the extent to which, and the *ways* in which, habitual behaviors are controlled by automatic, non-conscious processes. Because definitions of habits place considerable emphasis on the non-conscious, automatic characteristic, it often engenders the false belief that habitual behaviors, insofar as they are global actions observed at the 'macro' level, are exclusively controlled by such processes. However,

developments in theory on habit have made it clear that complex behaviors like physical activity are unlikely to be exclusively controlled by non-conscious processes<sup>1</sup>. Such behaviors involve multiple sub-actions and strategic sequencing of those actions in order for the observed behavior at the ‘macro’ level to be performed. It is, therefore, unlikely that the behavior and all its sub-actions are performed automatically and non-consciously. As Phillips (2019) suggests, “to enact... a complex health behavior without conscious awareness is unlikely in the extreme, and no data exists to show exercising can be done without conscious awareness of one’s actions” (p. 8). This is echoed by other authors. For example, Wood (2017), invoke the distinction between reasoned, deliberative decision making and automatic, non-conscious processes proposed in dual process models of behavior (Evans & Stanovich, 2013; Hagger, 2016; Strack, Werth, & Deutsch, 2006), suggest that “any dualist comparison between acting on habit versus acting on deliberate thought is overly simplistic. Many behaviors... are complex and probably draw on both memory systems” (p. 393).

The notion, advocated by Gardner et al. (2016; 2019) and Phillips (2019), that complex behaviors are a blend of behaviors that are consciously enacted and automatic processes has utility in advancing theoretical understanding on habits, and is consistent with research evidence (Botvinick & Plaut, 2006; Clegg, DiGirolamo, & Keele, 1998; Graybiel, 2008; Savalia, Shukla, & Bapi, 2016). For example, research has shown that, over time, experience of executing a behavior in the presence of relevant contextual features or cues, which could be external or internal to the individual, as Phillips (2019) so eloquently argues, will lead to a gradual transition from conscious to automatic control (Lally, van Jaarsveld, Potts, & Wardle, 2010). Of course, this does not mean that the behavior becomes entirely controlled non-consciously, rather that some aspects of performing the behavior become less reliant or dependent on conscious, deliberative control with control shifting toward non-conscious,

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<sup>1</sup>It is important to note that many everyday behaviors could be considered complex from this analytic perspective. As Gardner (2015) points out, “there is a disconnect between these relatively complex behaviours and the simple actions that have been the focus of investigation within other sub-disciplines of psychology” such as research by behaviorists, which tends to focus on simple behaviors like “pulling strings and lifting latches”, and research by neuroscientists that continues to “investigate habit through observations of key presses, lever pushes and simple object selection tasks” (p. 281). From this perspective, therefore, even relatively mundane actions like getting dressed or making a cup of tea should be considered complex, and can be broken down into sets of sub-actions that could vary in the extent to which they are controlled by automatic or conscious processes.

automatic processes. For example, if one were to conduct a ‘meso’ or ‘micro’ level analysis of the sub-actions that comprise the performance of a particular physical activity, it is possible that some will still be consciously determined and others controlled by automatic processes. For example, sets of actions required for the ‘macro-level’ observable behavior of ‘going cycling’ is likely to require identifying an appropriate time, evaluating feasibility (e.g., weather traffic conditions), assembling necessary kit and getting changed, collecting bike, riding the bike out of the driveway, and so on. Each of these behaviors may be controlled by conscious, deliberative, or habitual, automatic processes. If sufficient sub-actions that comprise the behavior observed at the ‘macro’ level come under automatic control, then the ‘net’ effect will be for the behavior to be experienced as habitual.

Similarly, the distinction between habitual instigation or initiation and habitual execution is also helpful for describing the processes controlling performance of complex behaviors, and chimes well with evidence and anecdotal experience (Gardner et al., 2016; Gardner et al., 2019; Phillips, 2019; Phillips & Gardner, 2016). Complex behaviors like physical activity not only require strategic coordination of sets of sub-actions to perform, but also considerable planning, forethought, and decision making to instigate in the first place. As an individual develops a habit for that behavior, the high effort and costly deliberation involved in the decision to perform the behavior is likely to become less so. For example, having undergone all the thought processes involved in the decision to go to the gym (e.g., weighing up the costs and benefits of doing so; identifying the time, place, clothes, partner, and equipment required) on multiple occasions, an individual is likely to become less dependent on such processes or make such decisions extremely rapidly and efficiently. This shift is likely manifested in the habitual instigation of the behavior – the decision to act will be arrived at in a rapid, efficient manner. The enactment of the behavior itself may still require planning and conscious decisions to execute, but the decision itself bears the hallmarks of a habit. Habitual instigation, therefore, focuses on habitual ‘decision making’ or formation of a commitment to action (Gardner et al., 2019), as opposed to the habitual enactment of the chain of sub-actions that comprise the behavior observed at the ‘macro’ level.

Of course, some of the sub-actions involved in the execution of the behavior may also shift in control from deliberative to automatic processing, and if the ‘net’ control over sub-actions shifts toward automatic control the execution of the behavior will be experienced as habitual. This is corroborated by research that has demonstrated that health behaviors, including physical activity, are experienced as ‘more habitual’ as experience with making the decision and enacting the behavior increases (Lally et al., 2010). This perspective also entails that the opposite can happen – that changes in the context may lead to some sub-actions that form part of a behavioral sequence to shift from habitual to deliberative control, consistent with the habit discontinuity hypothesis (Verplanken, Roy, & Whitmarsh, 2018). Taken together, these proposals provide a more nuanced view of habitual behaviors and the processes involved in developing habits for complex behaviors.

As a habitual behavior develops, just as some sub-actions that make up the ‘macro’ behavior become less controlled by conscious processes, the experience of the behavior as one that is deliberately controlled may shift. People will likely be aware of their actions and behavior, but also note changes in the extent to which the behavior requires deliberative, effortful control. This is likely to be reflected in meta-cognitive measures like the self-report habit index (Verplanken & Orbell, 2003), which ask people to reflect on the extent to which their behavior is determined by automatic processes (e.g., “Physical activity X is something I do without thinking”). Although sometimes individuals may not have complete access to the processes that control their behavior, and may sometimes erroneously attribute control over their behavior to one process or another (Hagger, Rebar, Mullan, Lipp, & Chatzisarantis, 2015), generalized shifts in experience are likely to reasonably track generalized shifts in relative control from deliberative (slow, time-costly, considerable processing required) to automatic (fast, efficient, less processing required). Recently, Gardner et al. (2016) have modified these scales to track reflections on habitual instigation (e.g., “Deciding to do physical activity X is something I do without thinking”) and execution (e.g., “Once I have decided to do physical activity X, it is something I do without thinking”) of habits. These inventories may, therefore, be appropriate to capture the extent to

which, and the ways in which, the balance in the control over the behavior or, more accurately, the multiple sub-behaviors that comprise the behavior, has shifted from conscious to non-conscious. This does not mean individuals are unaware of their actions – acting habitually does not mean that individuals perform behaviors as ‘non-thinking automatons’ (Chung et al., 2017), they are likely to be acutely aware of their actions – and their experiences may shed light on the processes that control them.

The advances in the theory of habit for complex behaviors like physical activity, particularly the notion that habits for such behaviors comprise multiple sub-actions, some of which may be under deliberative control, some under automatic control, and that behaviors can be initiated or executed habitually, should be incorporated into definitions of habit. This will lead to better understanding and a less polarized view of habitual behaviors as automatic, non-conscious actions. Current definitions of habit emphasize the non-conscious component. According to Wood (2017), for example, “habits are implicit associations between contexts and responses that develop through repeated reward learning. When people act out of habit, the response is automatically triggered by perception of relevant context cues” (p. 389). Similarly, I defined habit, in accordance with ‘contemporary theory’, “as a specific action or behavioral tendency that is enacted with little conscious awareness or reflection, in response to a specific set of associated conditions or contextual cues” (Hagger, 2019, p. 119). In light of recent developments, the commentaries, and the arguments I outlined previously, I suggest that such definitions need revision to account for the ‘relativist’ position of habits. For example, I think such definitions would benefit from revisions to include Gardner’s (2019) suggestion that “any behaviour can be said to be habitually executed where habit plays some facilitating role. This allows for performances that are partly driven by habit, and partly consciously regulated” (p. 5). Qualifying definitions of habits with information on the relative control over actions by automatic and conscious processes, and instigation and execution, may unify the definitions of habit with contemporary theoretical views.

### **Habits, Behavioral Scripts, and Implicit Beliefs**

Related to the need to extend definitions of habits to encompass perspectives on habit as blended sets of actions that can be instigated or executed habitually, I also propose a need to recognize that habits are a particular or unique form of automaticity, but are also aligned with other sets of automatic processes that determine behavior. Habits are frequently described as goal independent and, therefore, separate from other implicit or non-conscious processes that lead to behavior, such as implicit goal activation, semantic priming, and behavioral scripts (Wood, 2017; Wood & Runger, 2016). I propose that habits should not be viewed as entirely distinct from these other types of automatic responding, but as part of an overarching set of non-conscious, automatic processes. I contend that habits are likely to coincide with knowledge structures stored in associative memory, developed in conjunction with the habitual behavior, and include action representations, implicit evaluations of the behavior, and the sets of cues and contingencies that activate both the behavior and the sets of associated knowledge structures. This view seems to correspond with some of the perspectives on habit offered by other theorists (Aarts & Dijksterhuis, 2000; Klockner & Matthies, 2012), including those of Gardner et al. (2019) and Phillips (2019). As an example, I have outlined potential links between different non-conscious or automatic constructs, including action representations that often reflect habits, implicit beliefs, and cues or environmental factors (see Figure 1).

There is conceptual and theoretical utility in isolating habits from other automatic processes, but it is also important to recognize that habits are likely to share common features and content with other processes. Identifying the commonalities in content between habits and other automatic processes, and how habits may relate to those processes, may provide further insight into the automatic determinants of action. It may also assist in further clarifying definitions of habits, what they encompass, and what processes covary with their development and presentation. Habits are proposed to be distinct from automatic activation of goals or motivational cues, because such activation may activate multiple behavioral responses that service the goal, while links between cues and habitual behavioral responses are proposed to be invariant and independent of goals; cue-response links are, therefore, proposed to be

behavior specific (Wood, 2017). Evidence for this comes from research demonstrating that individuals act in accordance with their habits but not in accordance with primed goals or intentions (Ji & Wood, 2007; Neal, Wood, Labrecque, & Lally, 2012). Therefore, goal priming is likely to activate sets of specific goal-directed behaviors linked to fulfilling the goal, while cues to habits may be linked to specific behavioral responses and not dependent on goals.

However, it seems unlikely that habitual behaviors are entirely independent of other implicit knowledge structures. This has been reflected in some perspectives on habit. For example, some theorists view habitual actions as a function of behavioral schema (Aarts & Dijksterhuis, 2000; Klöckner & Matthies, 2012). Schema are knowledge structures in which conceptually-related information is represented in associative memory, and are developed over time through experiences with the target concept (Abelson, 1981; Schank & Abelson, 1977). Behavioral schema link a given behavior with other information such as evaluations of the behavior, the goals or reasons for performing them, and the contexts and cues typically associated with its performance derived from experience (cf., Collins & Quillian, 1969). Such organizational structures may be instrumental in how individuals represent information and drive understanding of events and planning (Zacks & Tversky, 2001). The experience of a particular physical activity with positive evaluations or affective response may result in stored associations between the positive beliefs or affect and physical activity behavior in the schema. Similarly, if the activity is regularly experienced in conjunction with specific contexts, cues, or people, as in a habit, they too will likely to be represented in the schema. Therefore, the components of habits, specific cues and contexts, and the behavioral response are likely to be part of a more elaborate common knowledge structure and, therefore, associated with other implicitly-held information relating to the behavior in the form of a behavioral schema (see Figure 1).

The existence of schema opens up the possibility that habitual behaviors could be generated through other automatic processes, such as through the activation of conceptually-related information, like implicit attitudes or beliefs with respect to the behavior (Klöckner & Matthies, 2012; Verplanken &

Aarts, 1999). For example, activation of beliefs or attitudes toward particular behaviors may serve to initiate the behavior and set in motion the sequence of actions for the behavior to be observed at the macro level. In such cases, the same habitual behavior could be initiated through activation of different types of information held on the schema, either by cue/context-response pairings or by activation of other associated information. There is also the intriguing possibility that the greater the behavioral automaticity, the more individuals are likely to act in accordance with their implicit attitudes. Recent research, for example, has demonstrated that implicit attitudes moderate relations between self-reported experience of habit and behavioral enactment (Phipps, Hagger, & Hamilton, 2019). In two studies, the interaction of habits measured by self-reported automaticity and implicit attitudes measured using an implicit association test (IAT) predicted health behaviors. Individuals with stronger habits were more likely to have stronger implicit attitude-behavior relations. Such research suggests that those for whom behaviors are habitual are more likely to act consistent with their implicit attitudes. This points to the possibility that as individuals' behavior becomes more automatic, so implicit attitudes are developed and coincide with future action.

Related to this, Gardner et al. (2019) provide an example of how habits themselves further promote the behavior through the development of implicit beliefs. He suggests that habitual execution of physical activity may lead to experiences of mastery and perceptions self-efficacy in performing the behavior in future: "We hypothesise that habitual execution may impact on PA engagement via several mechanisms, including self-efficacy, affective judgements, and self-regulatory capacity" (p. 8). While such a process may have been intended to outline how habitual execution links with conscious deliberative processes that perpetuate behavior, it also suggests that habits may contribute to the development of implicit beliefs. For example, repeated experiences of a physical activity behavior associated with positive evaluations (e.g., positive affective beliefs) may lead such evaluations being represented implicitly. For example, a recent study adopting a longitudinal panel design tested reciprocal effects of habits, past behavior, and implicit beliefs toward a health behavior (Hamilton,

Phipps, Loxton, Modecki, & Hagger, 2019). In this study, self-report measures of habit and past behavior toward alcohol consumption, and implicit alcohol identity measured using an IAT, were taken at two points in time, four weeks apart. Cross-lagged analyses controlling for covariance stability of constructs indicated reciprocal relations between habits and implicit identity, but the effect of habits on implicit identity was larger. Another study indicated that activation of such implicit beliefs may lead to concomitant activation of behavior (Conroy & Berry, 2017). Habits may, therefore, serve to perpetuate a particular behavior by contributing to the development of positive beliefs about the behavior.

However, there is precious little research examining links between implicit cognition, information held schematically, and behaviors like physical activity. Future research should consider examining how experiencing behavior as habitual is associated with measures of implicit beliefs toward that behavior, and subsequent behavioral participation. It would also be important to test whether activating implicit beliefs with respect to a specific habitual behavior also instigates the behavior in the same way that presentation of the cues linked to that behavior. One way to do this would be to observe how implicit beliefs, measured using response latency tasks, develop as habits develop. It would also be useful to see how implicit beliefs, perhaps through evaluative priming, may serve to cue up a habitual behavior independent of the cues or contexts that typically cue up the behavior. This would provide clear evidence that habitual behaviors may be instigated by activating schema-related knowledge structures and by introducing the context or cues related to the behavior.

### **Summary and Conclusion**

I commend Gardner et al. (2019) and Phillips (2019) for initiating this debate on the role of habits in physical activity. I agree with many of their points, particularly the need for redefining ideas on habits, such as the nature of the conditions (e.g., cues and contexts) that may initiate behavior, and the need to consider complex behaviors like physical activity as comprised of multiple sub-behaviors that may be instigated or executed habitually, or through conscious processes. I contribute to this debate by calling for definitions of habits to incorporate these innovations and move away from a rigid

perspective of habits as single behaviors that are entirely controlled by automatic processes. Extending this, I have suggested that habits need to be viewed in conjunction with other automatic processes.

While it is useful to distinguish habits from other automatic processes, development, initiation, and enactment of habits is likely to be related to other automatic processes, such as implicit beliefs. I

suggest that future investigation is needed to fully verify links between implicitly held constructs and habitual behaviors.

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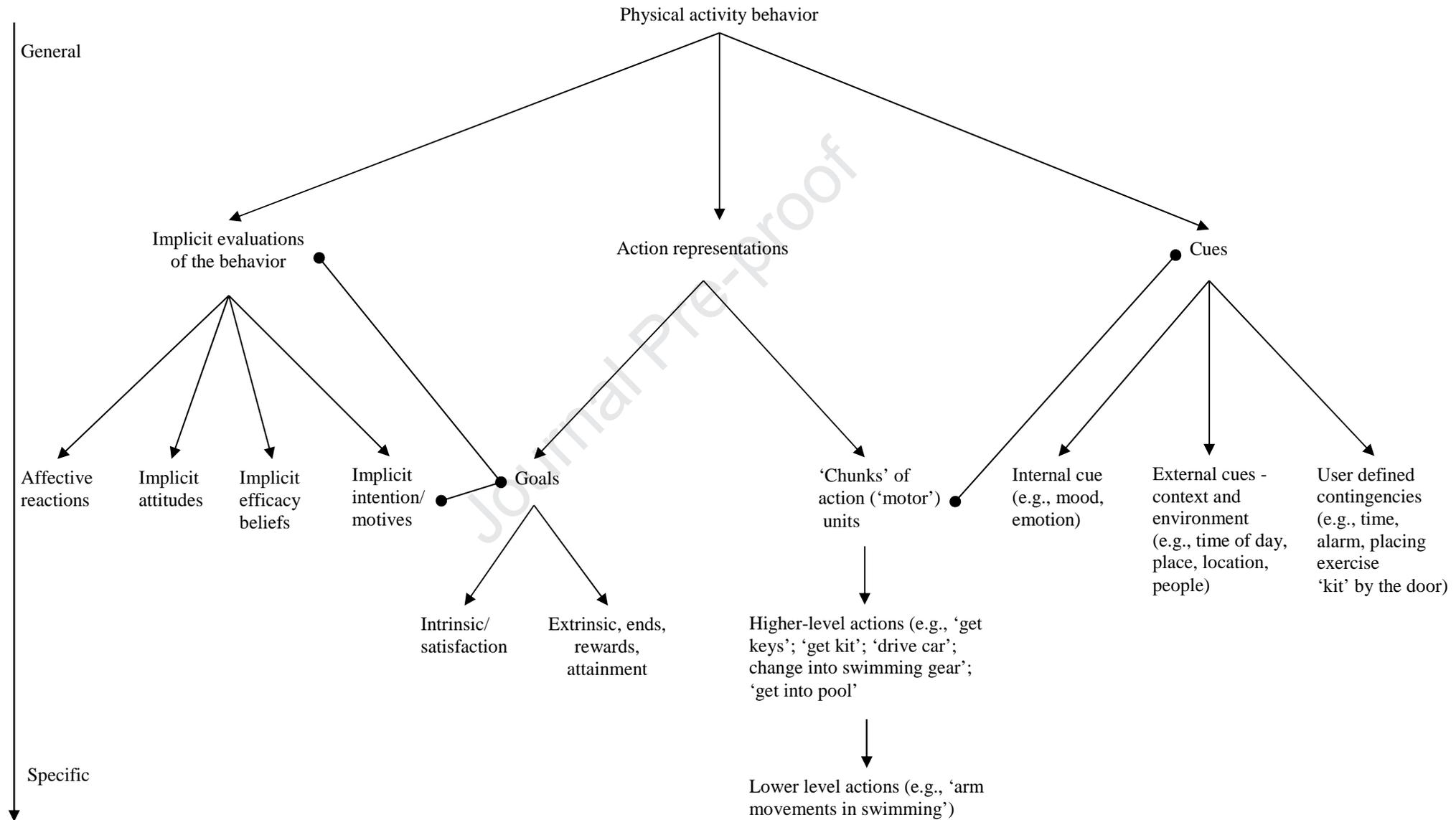
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Figure 1. Illustration of how different non-conscious constructs for a behavior may be related. The behavior is depicted at the apex with associated constructs and memory structures represented below with increasing specificity.



**Conflict of Interest Statement**

The author declares no conflicts of interest.

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