

The functional-cognitive framework for psychological research: Controversies and resolutions

Sean Hughes¹, Jan De Houwer¹, and Marco Perugini²

¹Department of Experimental Clinical and Health Psychology, Ghent University, Ghent, Belgium

²Department of Psychology, Università di Milano-Bicocca, Milano, Italy

*T*he scientific goals, values and assumptions of functional and cognitive researchers have propelled them down two very different scientific pathways. Many have, and continue to argue, that these differences undermine any potential communication and collaboration between the two traditions. We explore a different view on this debate. Specifically, we focus on the Functional-Cognitive (FC) framework, and in particular, the idea that cognitive and functional researchers can and should interact to the benefit of both. Our article begins with a short introduction to the FC framework. We sweep aside misconceptions about the framework, present the original version as it was outlined by De Houwer (2011) and then offer our most recent thoughts on how it should be implemented. Thereafter, we reflect on its strengths and weaknesses, clarify the functional (effect-centric vs. analytic-abstractive) level and consider its many implications for cognitive research and theorising. In the final section, we briefly review the articles contained in this Special Issue. These contributions provide clear examples of the conceptual, empirical and methodological developments that can emerge when cognitive, clinical, personality and neuroscientists fully engage with the functional-cognitive perspective.

Keywords: Functional-cognitive framework; Meta-theory; Cognitive psychology; Functional psychology.

Stop for a moment and imagine that you are a relative newcomer to the world of psychological science. Stretched before your eyes would lie an archipelago of academic islands, each home to a unique “tribe” or sub-discipline like social and cognitive psychology, as well as clinical, personality and neuropsychology. Travelling from island to island you would find that each tribe has devised its own unique culture (theories), language (terminology), set of tools (procedures) and (analytic) practices. Although these tribes typically operate independently from one another, most of them are united by a shared adherence to a belief system (philosophy of science) known as the mental mechanistic system. At its core resides three simple ideas. The first is that changes in behaviour occur when organisms interact with the environment. Second, that these changes are mediated by mechanisms, that is, processes that are themselves composed of discrete parts that interact with one another and are subject to specific operating conditions (Bechtel, 2008). Third, these mechanisms are mentalistic in nature. Therefore, the scientists’ goal is to develop

and test theories about the mental processes and representations via which organisms’ store, process and retrieve the information assumed to influence their behaviour (see Bechtel, 2008; De Houwer, 2011).

For well over 40 years now the mental mechanistic approach has influenced the scientific values, goals and assumptions of many, if not most in psychological science. Although it has undoubtedly accelerated our understanding of the human mind (for reviews, see Eysenck & Keane, 2000; Miller, 2003; but see Fiedler, 2014, this issue), it is important to realise that it is not the only way of studying psychological phenomena. Indeed, elsewhere in the archipelago one would find a number of tribes that are also studying the origins and properties of human behaviour, language and cognition. Setting foot on one of these islands, you would encounter a group of functional researchers who have developed their own belief system (behaviourism) and crafted a culture (theory), language (terminology), set of tools (procedures) and practices that differ to those seen in psychological science. Rather than hunting for mediating mental mechanisms,

Correspondence should be addressed to Sean Hughes, Department of Experimental Clinical and Health Psychology, Ghent University, Henri Dunantlaan 2, 9000 Ghent, Belgium. (E-mail: Sean.Hughes@UGent.be).

SH and JDH, Department of Experimental Clinical and Health Psychology, Ghent University, Belgium. MP, Faculty of Psychology, University of Milan-Bicocca, Milan, Italy. The preparation of this paper was made possible by Grant BOF09/01M00209 of Ghent University to JDH and VBO grant 01T02512 of Ghent University to JDH and MP.

these functional researchers first set out to discover which elements in the (past and present) environment moderate changes in behaviour. They then use this information to develop abstract types of functional knowledge (“laws of behaviour”) and eventually theories which enable them to predict-and-influence the phenomena of interest (see Chiesa, 1994; Zettle, Hayes, Biglan, & Barnes-Holmes, in press, for book length treatments).¹

THE FUNCTIONAL-COGNITIVE FRAMEWORK

It should come as no surprise that these two beliefs systems (mental mechanistic vs. behaviourism) have propelled their proponents down different scientific pathways, each with its own ideas about the value of certain types of theorising and empirical findings (e.g., Gardner, 1985; Hayes & Brownstein, 1986). Unable to reconcile these differences, the two traditions have largely gone their separate ways, sometimes fighting over their perceived scientific legitimacy, and more often than not, ignoring the fruits of their respective labours (see Baron-Cohen, 2014; Brown & Gillard, 2015; Miller, 2003). There have been many excellent treatments of this topic over the years and Roediger (2004) offers a particularly good one. In it, he refers to an exchange with a colleague (Endel Tulving) who argues that “psychology now designates at least two rather different sciences, one of behaviour and the other of the mind. They both deal with living creatures, like a number of other behavioural sciences, but their overlap is slim, probably no greater than psychology or sociology used to be when the world was young. No one will ever put the two psychologies together again, because their subject matter is different, interests are different and their understanding of the kind of science they deal with is different. Most telling is the fact that the two species have moved to occupy different territories, they do not talk to each other (any more) and the members do not interbreed. This is exactly as it should be.”

The special issue that you are now reading explores a different view on this debate. It focusses on the Functional-Cognitive (FC) framework, and in particular, the idea that cognitive and functional researchers can and should interact to the benefit of both (De Houwer, 2011). Simply put, the FC framework indicates that psychological science can be carried out at one of two

mutually supportive levels of analysis: either (a) at the cognitive level where researchers investigate the mental *mediators* of a behavioural effect or at (b) the functional level where researchers investigate the environmental *moderators* of behaviour. When research is conducted within the remit of this framework, a number of theoretical, methodological and empirical benefits emerge for both types of researchers. As we will discuss in more detail below, for those interested in the cognitive level it slams the door shut on those pernicious problems that follow from treating behaviours-as-proxies, kick starts the discovery of new mental mechanisms and can help refine existing mental theories. For their counterparts interested in the functional level, it reveals a whole new world of procedures, cognitive theories and findings that can be used to organise existing behaviour, predict novel behaviour and orientate researchers towards previously uncharted research domains.

This article and those elsewhere in this special issue have an admittedly ambitious goal – to explore the transformative potential of the FC framework for research conducted within psychological science. We begin with a short introduction to the framework itself. What has become clear from editing this special issue, speaking at international meetings and from discussions with colleagues, is that people differ in their perceptions of the framework’s core arguments and intentions. These perceptions are often coloured by historical assumptions about, and lack of interactions between, cognitive and functional researchers. At the same time, our own understanding of the framework has also evolved through full and active engagement with both traditions. We have come to appreciate that although it can be instantiated in several ways, only one of these instantiations is likely to meet with success. Therefore, we will first sweep aside any misunderstandings about the framework, present the original version that was outlined by De Houwer (2011) and then offer our most recent thoughts on how it should be implemented. Thereafter, we consider several issues that may influence the decision to adopt the framework and then speculate about its future. The final section briefly reviews the articles contained in this Special Issue. These contributions evaluate the framework’s strengths and weakness and highlight the conceptual, empirical and methodological developments that can emerge when

¹Note that for the sake of communication, we have somewhat simplified our story. For instance, few people realise that there are many different varieties of behavioral thinking that differ at both the level of philosophy and scientific practice (e.g., methodological behaviorism, radical behaviorism, contextual behavioral science). Instead, and more often than not, the term behaviorism is (incorrectly) equated with a mechanistic rather than a functional type of thinking, albeit one that is based on behavioral (e.g., S-R) rather than mental mechanisms. Rather than unpack this conceptual issue here, we will simply refer to “functional researchers” from now on whenever we want to speak of that broad group who conduct their scientific work at the functional level of analysis, that is, at the level of relations between environment and behavior.

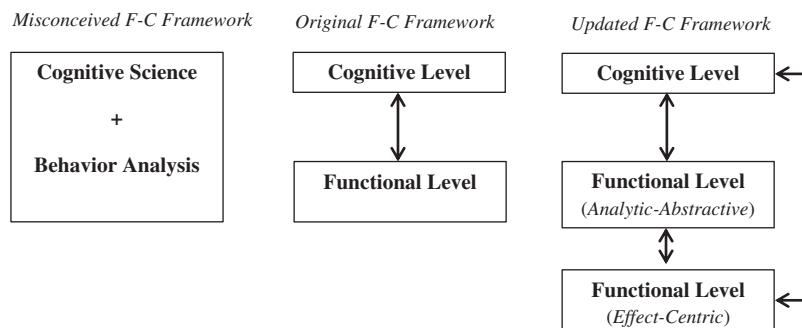


Figure 1. A visual illustration of the various ways in which the functional-cognitive (FC) framework can be implemented. A first, misconceived framework, would involve forcing cognitive science and behaviour analysis together. The original version of the framework (De Houwer, 2011) involves highlighting two separate but mutually supportive levels of analysis. The updated version of the framework makes explicit the distinction between the effect-centric and analytic-abstractive functional approaches.

cognitive, clinical, personality and neuroscientists fully engage with this perspective.²

WHAT EXACTLY IS THE FUNCTIONAL-COGNITIVE FRAMEWORK?

Misconceived FC framework

One of the core ideas in the FC framework is that research can be carried out at two mutually supportive levels of explanation. Some seem to have interpreted this as an attempt to merge cognitive science and (certain branches of) behaviour analysis. It is therefore important to make explicit that the FC framework was never intended as a call for the merging of specific intellectual traditions. Such a view misrepresents the FC framework in two ways. First, the framework does not differentiate between the cognitive and functional levels on the basis of group membership (i.e., which “tribe” or scientific tradition one identifies with) but on the basis of scientific goals (i.e., the type of explanation that one focusses on). Most researchers who call themselves cognitive probably focus on mental mechanisms whereas those belonging to behaviour analytic societies probably focus on environmental influences on behaviour. However, it is important to realise that within each tradition, people can differ in scientific goals and that across traditions, there can be communalities in scientific goals (Figure 1).

Second, the idea of merging cognitive science and behaviour analysis implies that researchers would need to give up their scientific goals. The FC framework, on the contrary, acknowledges that researchers can have different goals and thus different research agendas. The

logic here is as follows: most cognitive scientists are interested in identifying the mental states and operations that causally mediate between environmental input and behavioural output. Analyses carried out by their functional counterparts are scientifically unsatisfactory given that they say nothing about the mental mechanics of the mind. From a cognitive perspective, functional analyses simply yield incomplete “descriptions” of environment-behaviour interactions that lack a conceptual framework that can heuristically organise existing data or generating novel predictions. At the same time, functional researchers focus on environment-behaviour relations in an effort to predict-and-influence the phenomenon of interest. They typically consider analyses that incorporate mental states and operations as speculative, incomplete and as potentially distracting from the scientific goal at hand (see Stewart, 2015). Therefore, instantiating the FC framework as a merger of the two approaches will actually hamper rather than optimise scientific progress because it fails to reconcile the different scientific agendas of cognitive and functional researchers. In fact, such a misconceived framework actually rejects the idea that research carried out in these two traditions can be mutually supportive because a denial of the fundamental difference in goals would imply that both approaches are striving for the same things and are thus competing for scientific legitimacy.

Original FC framework

Let us be clear here. The FC framework outlined by De Houwer (2011) bears little resemblance to that described in the previous section. Instead, the framework

²Another short note on terminology seems warranted here – especially given that many terms are used interchangeably across different levels of analysis. When we use the term functional we are referring to relations between (past and present) environment and behavior and not to the fact that (a) something is adaptive for the organism or to (b) the function or “purpose” of a mental construct. Likewise, when we use the term cognitive, we refer to the mental level, and in particular, to “the complete set, rather than a subset, of all mental processes and representations, including affective and motivational constructs” (De Houwer et al., 2013b, p. 254).

distinguishes two different *levels of explanation* that vary in their explanatory targets and constructs. Functional explanations are directed at explaining behaviour in terms of environmental events. Cognitive explanations are directed at explaining environment-behaviour relations in terms of mental mechanisms. There are different reasons why some researchers would prefer functional explanations (e.g., because they have the aim to predict-and-influence behaviour) whereas others prefer cognitive explanations (e.g., because for them something is “truly” understood only if the mechanism is understood). The FC framework does not interfere with the goals of a researcher, nor does it pass judgement on those goals or the reasons behind those goals. Instead, it emphasises that both levels of explanation can be mutually supportive for one another. By conceptualising the two levels in this way, the framework purposefully sets debates about the scientific primacy of intellectual traditions or scientific approaches to the side (see Reyna, 1995, for such discussions). It does not see differences in explanatory targets and concepts as an insurmountable obstacle to communication between the two levels nor does it view these differences as inevitably leading to competition between intellectual traditions. Rather, it draws upon the knowledge gained at one level to advance progress at the other.

Merits of the original FC framework

We believe that the original FC framework had many merits. First, it highlighted the functional level of analysis, and by implication, a way of explaining human behaviour that is important in its own right. Unlike the cognitive level, functional analyses do not appeal to, or make any assumptions about, mental states and their operation. Instead they involve the identification of functional relations between behaviour and the environment (i.e., behavioural effects). These relations are not descriptive but rather explanatory: establishing the presence of an effect “implies a hypothetical explanation of the behaviour that is couched in terms of elements in the environment rather than mental constructs” (De Houwer, 2011, p. 205).

Second, by drawing attention to the functional level and requiring outcomes to be defined as behavioural effects rather than mental constructs, the framework offered researchers a practical way to side-step the various problems that plague the behaviour-as-proxy approach. Simply put, the behaviour-as-proxy problem refers to the fact there appears to be no method with which to directly interact with mental constructs. Researchers are constrained insofar as they can only act on the world in some way, observe a change in behaviour and based on the effect of their actions, postulate that a mental mechanism (operating under a set of mental conditions) is responsible for the obtained outcome. Those subscribing to the

mental approach often attempt to circumvent this problem by treating a behavioural effect as a “proxy” for the mental construct under investigation. In other words, the presence of a particular change in behaviour – and the environmental conditions under which it is observed – is treated as evidence for the presence of a mental construct and the conditions under which it operates. The problem is that this approach is built on questionable assumptions (e.g., that the mental process is the only determinant of the behavioural effect). Violations of these assumptions can undermine the construction of mental theories and the interpretation of empirical data (see De Houwer, 2011; De Houwer, Gawronski, & Barnes-Holmes, 2013b). Unfortunately, treating behaviour as a proxy for mental constructs is not an isolated practice but rather an all too common one in psychological science (see Eagly & Chaiken, 2007; Fazio, 2007; Krosnick, Judd, & Wittenbrink, 2005; Poldrack, 2006 for similar arguments). The FC framework draws attention to the above problems, equips psychologists with a means to avoid conflating behavioural effects and mental constructs and does so in a way that is applicable to a wide range of psychological phenomena.

A third merit of the FC framework is that it emphasised that while the cognitive and functional levels are independent from one another they are still deeply intertwined. Researchers operating at the cognitive level often formulate their mental theories by drawing upon existing environment-behaviour relations (behavioural effects) and test the utility of those theories by generating new effects. By accumulating and refining their understanding of these effects they constrain existing mental models and force them to increase the precision of their assumptions or even to alter them altogether. Thus, activity at the functional level provides the raw fuel (behavioural effects) needed to drive the engines of mental theorising. In this way, a strong functional approach is a basic requirement for a strong cognitive approach (for similar arguments see Fiedler, 2014). At the same time, the framework also highlighted that theories at the mental level can systematically organise functional knowledge (i.e., heuristic value) and generate new hypotheses about the conditions under which those effects occur (i.e., predictive value). In this way, a strong mental approach can also facilitate a strong functional approach.

Finally, the framework clarified that this beneficial interplay is only going to work when the two levels are strictly separated from one another at a conceptual level. This means that (a) separate terms should be used to explain behavioural effects and mental constructs, (b) terms from different levels should not be intermixed and that (c) empirical findings should first be described, as much as possible, at the functional level before doing so at the cognitive level. This ensures that a priori ideas about mental mechanisms do not constrain the number and type of constructs that are considered relevant for an effect or the effects relevant

to those constructs. This approach increases the speed of theoretical innovation (by removing restrictions on which constructs are considered relevant to the effect), facilitates the discovery of new functional knowledge (by allowing for alternative mental theories and thus novel predictions) and ensures that the accumulated body of functional knowledge remains valid regardless of changes in mental theories across time. Therefore, just as certain practices increase the likelihood of replicating psychological research (Nosek et al., 2015), the FC framework increase the likelihood of open-mindedness and cumulative growth when carrying out that research. To some extent, the merit of the framework is evident from the fact that it is already beginning to reshape how we think about a variety of domains, from attitudes (De Houwer, Barnes-Holmes, & Moors, 2013a), and learning (De Houwer et al., 2013b) to evaluative conditioning (Hughes, De Houwer, & Barnes-Holmes, in press), cognitive control (Liefoghe & De Houwer, 2015), personality (Perugini, Costantini, Hughes, & De Houwer, 2015), neuroscience (Vahey & Whelan, 2015) and clinical psychology (De Houwer, Barnes-Holmes, & Barnes-Holmes, 2015). Indeed, thumbing through the pages of this special issue reveals that the above arguments translate into concrete recommendations for scientific activity in a wide variety of psychological domains.

Reflecting on the framework

Despite its many merits, the original FC framework was obviously not perfect. One could argue that it offered nothing that cognitive scientists were not already doing, insofar as grafting a functional level (focused on behavioural effects) onto a mental level is simply a way of relabeling (good) cognitive psychology. Surely, all experiments involve a functional approach wherein independent variables are manipulated and their effects on dependent variables examined? Likewise, the framework did not require any interaction between cognitive and functional researchers so long as the former clearly separated their mental constructs from their behavioural effects. By equating the functional level with behavioural effects the framework may have presented an overly simplified, unrepresentative view of that level which did not exploit its true potential (Hughes & Barnes-Holmes, in press-a; Zettle et al., in press). Thus, interactions between cognitive scientists and functional researchers were optional at best and unnecessary at worst (for related arguments see Barnes-Holmes & Hussey, 2015).

Clarifying the FC framework

Taking a step back, we believe that the framework can be further developed by not only addressing the above issues but by also unleashing the full potential of the

functional level. This can be achieved by highlighting that there are *two* ways of conducting research at the functional level: either in an effect-centric or analytic-abstractive manner. The *effect-centric* approach is what we have discussed to this point and is probably what most psychologists are familiar with: it involves manipulating an independent variable (environment) and measuring its effects on a dependent variable (behaviour). For instance, researchers might compare children who are told that access to ice-cream depends on their eating vegetables at dinner to children who receive no such instructions and then measure their respective vegetable consumption. They might also examine whether use of Facebook increases or decreases when people receive content alerts, or even if the likelihood that a dog will bite the postman changes following one type of obedience training versus another. Although these analyses generate precise functional knowledge about the relationship between environment and behaviour, it is a type of knowledge that is limited in its scope (i.e., effects that only apply to a certain procedure or sets of situations).

It is important to realise that a second functional approach also exists. This *analytic-abstractive* approach is typically used in behaviour analysis and involves a two-step process of (a) identifying specific functional relations between environment and behaviour, and then (b) abstracting these relations into general behavioural principles that are precise (explain a specific set of behaviours), far reaching (explain a comprehensive range of behaviours across a variety of situations) and scientifically coherent (consistent across analytical levels and domains such as biology, psychology and anthropology; see Barnes-Holmes & Hussey, 2015; Hughes, De Houwer, & Perugini, in press). Examples of these principles include reinforcement and stimulus control (see Liefoghe & De Houwer, 2015). Functional researchers seek this type of abstract functional knowledge out because it can reveal similarities and differences between effects that would otherwise remain hidden. Moreover, by weaving different behavioural principles together, they can and have developed functional theories. These theories allows them to predict-and-influence a wide range of psychological phenomena including language, problem solving, implicit cognition, self and perspective taking, intelligence and psychopathology (for recent reviews see Hughes & Barnes-Holmes, in press-a, in press-b; Stewart, 2015). Please note that these two functional approaches (effect-centric and analytic-abstractive) can be seen as two endpoints of a continuum ranging from topographical (i.e., formulated in terms of superficial characteristics of dependent and independent variables that apply only to one or limited set of variables) to abstract (i.e., formulated in terms of abstract characteristics of dependent and independent variables that apply to a wide range of variables).

Merits of the analytic-abstractive level

The analytic-abstractive level was certainly alluded to, but not articulated in, the original FC framework. By actively incorporating it here, we highlight a new functional level with its own unique merits. Foremost among these is the idea of *abstract* functional knowledge that is not restricted to a certain procedure but that can explain a wide variety of topographically different outcomes (i.e., knowledge that is both precise and far reaching). Access to this type of knowledge rarely (if ever) emerges within a single line of effect-centric research. To illustrate why, take the previous example of children's eating habits, a disobedient pet and persistent checking of one's Facebook profile. Approaching these behaviours in an effect-centric manner might lead researchers to postulate three separate effects (e.g., a dessert effect, a disobedience effect and a checking effect) and suggest that, because those behaviours look different, involve different organisms, stimuli and events, they must reflect three separate and unrelated phenomena. Yet, from an analytic-abstractive position these three behaviours can all be viewed as instances of the same phenomenon (reinforcement). Similarly, stopping one's car at a red traffic light and accelerating in the presence of a green light or taking a cake out of an oven after an alarm rings can both be explained in terms of stimulus control (see Liefoghe & De Houwer, 2015).

This analytic-abstractive level has many implications for the FC framework. As we have seen, scientific analyses rarely terminate once a behavioural effect and its moderators have been identified. Rather researchers take this basic functional knowledge (effects) and operate on it in some way to better understand, predict and/or influence the phenomena of interest. The revised FC framework highlights that this "interpretative" operation can occur not only at the cognitive level as is often assumed (i.e., by postulating mental mechanisms that mediate between environment and behaviour) but also at the functional level (by abstracting effects into behavioural principles and by weaving these principles together to create functional theories). It also suggests that the type of interpretive operation applied to behavioural effects will likely depend on the one's goals, values and assumptions. Regardless of this decision, it is important to realise that progress at the functional (analytic-abstractive) level can lead to progress at the cognitive level and vice-versa.

Consider, for example, the cognitive level. Although an effect-centric approach solves the behaviour-as-proxy dilemma by conceptually separating to-be-explained effects and explanatory mechanisms, it runs the risk that research agendas become overly narrow and fragmented. Effect-centric functional research tends to focus on

whether and when a *specific* effect occurs and less on the possibility that this effect is just one of many different instances of a given phenomenon. Cognitive research on the mental mediators of the effect also tends to focus on the mental processes underpinning a *specific* effect and less on process accounts that apply across many different domains.³ This approach differs dramatically from the analytic-abstractive position which provides a comprehensive, unifying way to describe many different effects in non-mental terms. Once cognitive researchers adopt an analytic-abstractive functional perspective, novel questions can emerge about the mental processes that are common to those different effects. To illustrate, take the topic of cognitive control. In this domain, the Stroop effect, Gratton effect and Simon effect all refer to the specific outcomes of particular procedures and are often thought to be underpinned by different mental mechanisms. As Liefoghe and De Houwer (2015) demonstrate, these and many other cognitive control effects may actually (functionally speaking) represent instances of the same behavioural principle (stimulus control). Such an approach offers much that an effect-centric position does not. It sets the stage for a general taxonomy of cognitive control wherein effects are organised according to their functional commonalities and differences. It gives rise to a conceptual platform that facilitates communication between cognitive researchers who adopt different terminologies and mental theories. It offers a framework for creating new tasks, discovering new effects and by implication, unlocking new questions about cognitive control processes (see Perugini et al., 2015 for similar arguments in the context of personality). And finally, it highlights the possibility that topographically different but functionally similar effects might be mediated by similar mental processes. In other words, the analytic-abstractive level not only unlocks new ways of conceptualising data at the functional level but also provides another type of input for building and evaluating mental theories. Just as basic functional knowledge (effects) provides the input for specific mental theories so too can abstract functional knowledge (behavioural principles) provide the input for overarching mental theories. This abstract functional knowledge places no a priori constraints on mental theorising given that it has nothing to say about the mental mediators of behavioural principles. But it does place a posteriori restrictions on theories by highlighting consistencies across outcomes that need to be explained (e.g., why is it that many behaviours are controlled by their consequences, even when different stimuli, procedures, and organisms are involved?). This abstract knowledge can also be used to constrain the rate of theoretical expansion at the mental level and provide another dimension along which existing

³Note that this is typically but not always the case. For instance, dual-process (Gawronski & Creighton, 2013) and overarching cognitive theories that apply across a number of domains have attempted to explain a wide variety of effects (e.g., Anderson, 2013).

theories are evaluated. For instance, if the value of a mental theory is (in part) determined by its heuristic and predictive value (Gawronski & Bodenhausen, 2014) then overarching mental models that can explain entire laws of behaviour (rather than single effects) are going to have greater heuristic and predictive power than those that cannot. Thus a strong functional (analytic-abstractive) level can lead to a strong cognitive level. Incorporating the analytic-abstractive level also has merits for empirical research. If it is the case that an effect is just one instance of a behavioural principle then all knowledge accumulated about that principle can immediately be applied to an effect. Take our previous example of vegetable consumption as an instance of reinforcement wherein the probability that the child will eat their greens depends on its consequences (e.g., access or removal of a dessert). Over 50 years' worth of functional knowledge indicates that the relationship between behaviour (vegetable eating) and its consequences is influenced by many factors, from the nature of the context (having dinner at home vs. at a restaurant), and stimuli (e.g., presence vs. absence of a dessert menu), to the responses (e.g., crying vs. eating vegetables), consequences (access to dessert vs. reprimand) and organisms involved (e.g., parent vs. babysitter) (see Catania, 2007). Similarly, if it is the case that cognitive control effects are just one instance of a larger principle known as stimulus control then the above argument also applies (i.e., our understanding of the moderators of stimulus control can be used to inform our understanding of cognitive control effects; Liefooghe & De Houwer, 2015). This argument has recently been applied to, and may reshape our thinking in, other domains such as evaluative conditioning (Hughes, De Houwer, & Barnes-Holmes, in press). It is worth pausing to reflect that the analytic-abstractive level not only provides insight into existing effects but can also stimulate entirely new empirical discoveries. Take the application of the framework to the study of attitudes (De Houwer et al., 2013a, 2013b). In this article, De Houwer et al. argued that attitude research involves the study of evaluation, which in turn is defined as the impact of stimuli on evaluative responses. These responses are usually established in one of four ways: either by manipulating regularities in the presence of a single stimulus (e.g., mere exposure), two or more stimuli (evaluative conditioning), between behaviour and its consequences (approach/avoidance learning) or by instructions (persuasion). Building on this suggestion, Hughes et al. (in press) identified a fifth and previously undiscovered way of changing evaluative responses (i.e., via *intersections* between regularities). The discovery of this pathway was a direct consequence of applying the FC framework to the domain of attitudes. Thus, a strong functional (analytic-abstractive) level can lead to a strong empirical developments at the effect-centric (functional) and mental levels.

The benefits of the revised framework are by no means unidirectional. For those operating at the analytic-abstractive level the theories and procedures devised, as well as findings obtained at the mental level could serve an important "orientating" function. In other words, developments at the mental level could highlight previously undiscovered domains with significant implications for human behaviour as well as new procedures for capturing and manipulating those behaviours. Indeed, the cognitive literature is replete with phenomena that have yet to be systematically explored in analytic-abstractive terms, such the behaviours people refer to when they use words such as creativity and imagination, intelligence, persuasion, obedience to authority, judgement and decision making, emotional and moral development, close relationships and personality. While recognising that not all phenomenon identified at one level will necessarily be of interest to those operating at the other (Barnes-Holmes & Hussey, 2015), we do believe that there are many aspects of human psychological life that have been studied at the cognitive level which would also be of interest to those at the functional level. Several authors have already adopted such a perspective, noting how procedures like the Implicit Association Test and mental theories of automatic evaluation have influenced their own thinking and activity at the functional level (e.g., Barnes-Holmes, Barnes-Holmes, Stewart, & Boles, 2011). Therefore, a strong cognitive level can lead to a strong functional (analytic-abstractive) level by *orientating* researchers towards novel research domains, equipping them with procedures to explore those domains and highlighting basic functional knowledge (effects) that has already been accumulated in those domains.

Challenges facing the FC framework

Despite these merits, we see several reasons why readers may still be reluctant to apply the FC framework to their own work. First, a strict cost-benefit analysis may lead them to the conclusion that it requires a high initial "buy-in" with an uncertain potential return. Extracting the full benefit of the framework requires that they become comfortable with a foreign (mental or functional) language and at least appreciate the scientific assumptions, values and goals of their colleagues operating at different levels of analysis. Second, there may be an inherent lack of motivation for cognitive and functional (analytic-abstractive) researchers to interact given that their scientific agendas lead them down two very different pathways. Certain questions and outcomes may serve to stimulate those working at one level and yet be entirely obvious or redundant to those working at another level (see Barnes-Holmes & Hussey, 2015). Third, cognitive researchers may certainly recognise the need to conceptually separate constructs from effects but fail to see how

the framework could be implemented in their research domain or how it can improve their own scientific activity. Fourth, researchers operating at the analytic-abstractive functional level may see little value in the framework at all. They already have ways of interpretatively operating on behaviour (i.e., principles and theories) without the need to recourse to mental mechanisms. They could even argue that there is an asymmetric utility built into the framework insofar as one (mental) level needs the other (functional) but the second does not need the first (also see Fiedler, 2014). Therefore, unless the framework tangibly contributes to scientific activity at these two levels, then researchers may certainly stop and consider it, but then continue on with business as usual.

At this moment in time, we can respond to these doubts only by reaffirming our belief that adopting the framework can lead to unique benefits for both cognitive and functional researchers, benefits that outweigh the potential costs. But we realise that ultimately, the value or “success” of the FC framework will be judged on its ability to stimulate empirical, theoretical and methodological progress in different areas of psychological science in the years to come. Our recent work, and that outlined in this special issue, provide just a taste of what can be achieved when the framework is applied to the study of attitudes, learning, evaluative conditioning, cognitive control, psychotherapeutic strategies, neuroscience and personality. But this is really only the tip of the iceberg. The framework could be taken by others and applied to topics such as motivation, attention, memory, judgments, decision making or indeed any other research domain. The FC framework can function as a bridge between different islands in the psychological archipelago. Knowledge accumulated in one island can now flow into the other without reverting to ideological debates about which island has the best belief system, culture, language or practices.

The special issue

The first paper of the special issue (Stewart, 2015) focusses on the scientific assumptions, goals and values of functional researchers. He provides a succinct and accessible primer on the functional level of analysis that is accessible to cognitive researchers. The philosophical (functional contextualism) and theoretical (Relational Frame Theory) perspectives that have guided research at this level are first unpacked and then a phenomenon known as arbitrarily applicable relational responding (AARR) is discussed (also see Hughes et al., in press). For nearly 40 years now, AARR has captured the imagination of functional researchers due to its symbolic, flexible and generative properties, with many arguing that it represents the basic functional “building block” from which much of human psychological life springs forth.

A rising tide of studies seem to support this claim, with AARR linked to the origin and development of many linguistic and cognitive abilities. The author showcases how an analytic-abstractive perspective unlocks new insight into, and applications for, several areas in psychological science, from language and rule-following, to analogical reasoning, intelligence, theory of mind, psychopathology and implicit cognition.

Several contributions to the special issue consider concrete ways in which the FC framework can be implemented. Liefvooghe and De Houwer (2015) provide a vivid example of how the framework sets the stage for theoretical, methodological and empirical developments within cognitive psychology. They focus their attention on cognitive control (a collection of mental operations which enable humans to flexibly adapt in the face of changing demands) and argue that a wide variety of procedures and effects have been used to study this particular phenomenon. The authors then provide the blueprints for a functional approach to cognitive control that has three main advantages. First, it leads to a general taxonomy of cognitive control wherein effects are organised according to their functional commonalities and differences. Second, it gives rise to a conceptual platform that facilitates communication between cognitive researchers in this area. Third, it offers a framework for creating new tasks, discovering new effects and by implication, unlocking new questions about the processes that underlie cognitive control. Thereafter Perugini et al. (2015) extend the framework into the domain of personality psychology. They first draw attention to personality research which typically focuses on how stable individual differences in behaviour can be carved into different categories at different levels of abstraction (e.g., traits and facets) with the aim of predicting future outcomes. They then turn to the functional tradition which has attained an impressive understanding of the behavioural principles underlying human behaviour. The authors consider how developments at the functional (analytic-abstractive) and mental levels could be bridged in order to exploit the best of both worlds. Their functional-cognitive account is both *over-arching* in that it encompasses many if not all phenomena that are studied in personality research and *abstract* in that it does so in terms of general behavioural principles rather than superficial features of specific persons, situations or behaviours. They conclude by considering the potential of their approach for organising existing scientific knowledge and inspiring future research on personality. De Houwer et al. (2015) apply the framework to clinical psychology with the aim of revealing differences and commonalities among Behavioural Therapy (BT), Cognitive Behavioural Therapy (CBT) and Acceptance and Commitment Therapy (ACT). Drawing on the idea that functional and cognitive approaches are situated at different levels of explanation, the authors argue that functional

therapies such as traditional BT and ACT are not necessarily incompatible with CBT and may actually interact in a constructive manner. The degree to which these therapies align depends on whether they point to the same or different types of environmental causes. The authors propose that functional and cognitively oriented researchers and practitioners can therefore engage in potentially fruitful interactions, while remaining true to their respective aims, so long as the relationship between functional and cognitive explanations are explicated and the two levels are firmly separated. Vahey and Whelan (2015) explore how the FC framework can be used to enhance the study of the brain. They first shine a light on several problematic practices within neuroscience with a particular emphasis on the treatment of behavioural/neural activity as proxies for cognitive constructs and its various consequences. Rather than conflate the two levels of explanation the authors call for those levels to be strictly delineated, with neural activity first defined as behaviour and the functional relation between that behaviour and environment identified. Thereafter, mental operations can be deployed as heuristic tools to explain what mediates between environmental input and neural output. Several illustrations of how cognitive and functional neuroscientists can symbiotically interact to the benefit of both communities are then offered.

In the third and final section, a number of scholars put forward their personal views on the strengths and weaknesses of the framework. In their article, Barnes-Holmes and Hussey (2015) argue that the functional (*analytic-abstractive*) approach is richly theoretical. They first describe the steps involved in theory generation and evaluation at this level of analysis. They then reflect upon the framework and arrive at three main conclusions. First, that effective communication between the two traditions is likely to occur at the level of behavioural observations rather than effects or theory. Second, not all behavioural observations will be of mutual interest to both traditions. Third, observations that are of mutual interest will be those that serve to elaborate and extend theorising within a given tradition. The perceived strengths and weaknesses of the framework are then discussed, along with the possibility that it represents a third theoretical approach to psychological science rather than a meta-theoretical perspective as initially proposed. Proctor and Urcuioli (this issue) take a more critical stance and propose that certain conditions will need to be addressed before effective communication between cognitive and functional researchers can take place. They distinguish between two ways in which “functional” can be referred to by the framework: as either referring to functional relations that exist between environment and behaviour (the effect-centric functional approach) or to a specific intellectual tradition called Contextual Behavioural Science (CBS). They contend that if the framework involves forging connections between CBS

and cognitive science then it is unlikely to meet with success given their contrasting scientific agendas. If the framework is designed to ensure that behavioural effects are conceptually separated from the mental operations used to explain those effects then this is a noble pursuit – but one that cognitive researchers are already well acquainted with. For the authors the functional and cognitive traditions are vying for scientific legitimacy and attempting to combine and even compare the two may be a fool’s errand.

Finally, Fiedler (this issue) engages in a comparative evaluation of the functional and cognitive levels of analysis. He argues that cognitive psychology is deeply anchored in functional (effect centric) research and that progress within psychological science has often been driven by accumulating knowledge of functional (environment-behaviour) relations rather than “stellar moments” of mental process research. The author attributes the functional level primacy over the cognitive level for two reasons: (a) cognitive insight is contingent upon environmental interventions and behavioural outcomes, and (b) knowledge about mental operations and states needs to be cross-validated by returning to the functional level and conducting further interventions and measurements. Nevertheless, he takes the view that the functional and cognitive levels are deeply intertwined and jointly responsible for progress in behavioural science.

CONCLUSION

We began our article by comparing psychological science to an archipelago of intellectual islands, each populated with a different tribe (subdiscipline) busily developing its own culture (theories), language (terminology), tools (procedures) and (analytic) practices. We argued that most of these islands subscribe to one of two belief systems (mental mechanistic and behaviourism) that have historically propelled their proponents down two very different scientific pathways. Many have, and continue to argue, that these differences are an irreconcilable impediment to communication and collaboration, and that the two traditions will be forever locked in combat for scientific legitimacy. The FC framework introduced here takes a different stance. It sweeps such suggestions to the side and draws upon the knowledge gained at the functional (effect-centric and analytic-abstractive) levels to advance theorising and research at the cognitive level (and vice-versa). Readers looking to test this claim need only consider the strong selection of articles contained in this Special Issue. These showcase how the FC framework is starting to (a) influence research and thinking in clinical, cognitive, personality and neuropsychology in ways that (b) mutually benefit both cognitive and functional

researchers. Ultimately, only time will tell if the framework can achieve its ambitious aims. But as travellers who have already journeyed to functional and cognitive islands, and witness the value of their respective scientific fruits and labours, we believe that this is one trip that others should not miss out on.

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