



The AEF: Reinforcing Our Knowledge About Attitudes Using a Physics Metaphor

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The target article by Dalege, Borsboom, van Harreveld, and van der Maas (this issue) presents an *attitude entropy framework* (AEF) as a general theory of individual attitudes. Before turning to some points of issue with the framework, it is important to note that there is a lot to like about the proposed model. For example, the model focuses on understanding changes in attitudes that are assessed with both explicit and implicit measures. Other important aspects are the emphasis on elaboration and information integration as key psychological processes of attitude change. Elaboration is linked to the “dependency parameter,” defined in terms of attention and amount of thinking about an attitude object. In accord with prior attitude theorizing, the model highlights the importance of personal involvement as a key variable affecting elaboration (e.g., Petty & Cacioppo, 1990).

Also in accord with prior research and theory, the AEF proposes a positive relationship between elaboration and attitude strength. Greater elaboration about an attitude object (i.e., greater the dependency in a network) is argued to lead to greater attitude strength (i.e., more attitude stability, more consistency; (see Petty & Krosnick, 1995). Furthermore, the AEF argues that the very same variable (e.g., number of strong arguments) can influence attitudes under both high- and low-involvement conditions. All of these are very reasonable and interesting aspects of the proposed framework with which we agree. However, as positive as these features are, we also believe that the AEF provides more of a supplement to rather than a replacement for existing frameworks as it does not sufficiently articulate underlying mechanisms. We begin our assessment with the authors’ core entropy concept and then we turn to our comments on some of the other prominent ideas and specific hypotheses derived from the AEF.

Entropy as the Natural State of Attitudes

A core idea of the AEF, based in part on derivations from thermodynamics, is that the “natural state of an attitude” is to be inconsistent and unstable (i.e., in a state of entropy). Some antecedents and consequences of this are then articulated. Although one can admire the authors’ attempt to link attitude theory to physical laws, the true test of this theory, like any other, is whether the theory can account for existing data as well as or better than prior theories and whether it can generate new insights that were not apparent before

development of the theory. In this comment we use these criteria to explain our view of the utility of this new theory.

For starters, we wondered about the core emphasis on the natural state of attitudes as being inconsistent and unstable. If by this, the authors simply mean that no attitude is perfectly consistent and completely invariant over time, then we agree. However, attitudes would not be very useful if they were highly inconsistent and always changing. To emphasize the inconsistency and instability of attitudes seems to suggest that attitudes are not all that useful. Alternatively, one can put the focus on the idea that some attitudes—the ones we care about—are relatively consistent (though not perfectly so) and are relatively stable (though not perfectly so). That is, one can recognize that the normal state of some attitudes is to be *relatively* consistent and stable over time. People do not swing from loving (or even liking) ice cream to hating (or even disliking) it from moment to moment. That is, there is some consistency and stability in the valence of our core attitudes. Or, more precisely, one can hold that all attitudes fall along a *continuum* that goes from entirely stable and/or consistent to completely unstable and/or inconsistent with (in our view), many attitudes falling on the relatively stable and consistent side of the midpoint of this continuum. The goal of researchers is to understand the factors that determine where along this continuum any given attitude will fall and why. In short, we find this continuum view more appealing than focusing on the inconsistent/unstable end of the continuum.

Conceptual Separation of Consistency and Stability

A second issue with respect to the definition of entropy is, Why do the authors cluster consistency and stability together as if they inevitably co-occur? Research on attitude strength (e.g., see Petty & Krosnick, 1995) separates the concepts of consistency and stability into different domains. Specifically, attitude stability is categorized as one of the defining *consequences* of a strong attitude along with others, such as the ability of an attitude to resist an attack and its ability to guide other judgments and behavior. In contrast, consistency (or ambivalence) is viewed as one of several *antecedents* or indicators of attitude strength along with others such as attitude accessibility, certainty, and knowledge (see Krosnick & Petty, 1995). We believe that the traditional approach of separating antecedents of attitude strength (e.g., ambivalence) from consequences (e.g., stability) is more

conceptually fruitful than combining them into one entropy concept, because these constructs are not always related in a linear fashion.

For example, although higher attitudinal consistency (or lower ambivalence) can be associated with increased attitude stability, research shows that this is primarily true when the consistent (or univalent) attitude is also held with high certainty. If consistent (univalent) attitudes are held with low certainty, they tend to be associated with instability compared to inconsistent (ambivalent attitudes). That is, the consistency of an attitude interacts with certainty to predict attitude stability (see Luttrell, Petty, & Briñol, 2016). These same variables interact to predict the ability of an attitude to resist persuasion as well (see Clarkson, Tormala, & Rucker, 2008). If attitudinal consistency or ambivalence interact with other variables such as certainty to predict attitude stability and consistency can sometimes be positively related to stability (when certainty is high) and sometimes negatively related (when certainty is low), it may not be fruitful to combine consistency and stability into one “entropy” concept. Put simply, there is some benefit to conceptualizing variables such as consistency and certainty as antecedents to outcomes such as attitude stability and resistance as in the traditional attitude strength approach rather than lumping consistency and stability together into one entropy concept. It is always a challenge to know when to lump and when to split somewhat related concepts in psychology, but allowing a richer understanding of a phenomenon is one such rationale for splitting (Petty, Wheeler, & Bizer, 1999).

Treatment of Cues and Arguments Under High and Low Involvement

Providing a richer understanding of phenomena is also a reason not to abandon prior frameworks such as the dual process approaches to persuasion including the elaboration likelihood model (ELM; Petty & Cacioppo, 1986) and the heuristic-systematic model (Chaiken, Liberman, & Eagly, 1989) in favor of the AEF, even though Dalege et al. (this issue) are correct that some of the phenomena accounted for by these theories can be modeled by the AEF. For example, the AEF’s Hypothesis 8a is that variables that serve as heuristic or peripheral cues, such as source attractiveness, can lead to attitude change under both low and high involvement. Research has demonstrated that this proposition is true, but the dual process frameworks provide—and the AEF does not—the proposition that these variables, though potentially impactful under both low and high thinking, can do so by very different means and therefore have different consequences.

For example, under low-involvement (i.e., low-thinking) conditions, source attractiveness has the potential to serve as a simple cue regardless of whether it is relevant to the attitude object, because effectiveness as a positive cue requires the cue only to have a positive valence (Petty & Briñol, 2012). Thus, under low-involvement conditions, an attractive source could enhance persuasion for both a beauty product and a new bank. However, under high-involvement

(high-thinking) conditions, when source attractiveness is assessed as a piece of evidence (i.e., as an argument), enhancing source attractiveness will primarily be beneficial when it provides some evidence relevant to the merits of the product. Thus, under high-thinking conditions, source attractiveness could be effective when attached to a beauty product (e.g., if I use the product I may look like the source) but not when it is attached to an irrelevant product such as a bank (see Petty & Cacioppo, 1984a). Finally, when thinking is not constrained to be high or low, the same variable—source attractiveness—could bias the thoughts that come to mind. That is, the more people are motivated to agree with and like an attractive rather than an unattractive source, the more they may be biased in a positive way in their processing of the source’s arguments. This bias would be especially impactful when the arguments are ambiguous and open to interpretation rather than clearly strong or weak (e.g., Chaiken & Maheswaran, 1994).

Thus, simple cues like source attractiveness can produce attitude change under both high- and low-thinking conditions, but it is important to consider that the mechanism of change and the consequence of change could well be quite different even if the initial attitudinal outcome is the same. For example, if under low involvement, source attractiveness produces three units of attitude change by serving as a simple cue, that change is not likely to be as long lasting (stable) or impactful on behavior as when the same source attractiveness produces three units of change by increasing the number of favorable thoughts generated to the message. This is because considerable research suggests that attitudes changed because of relatively high-thinking processes are “stronger” (more consequential) than attitudes changed to the same extent by relatively low-thinking processes. This is largely because higher thought attitudes are more internally consistent, accessible, and held with more confidence than lower thought attitudes (Petty, Haugtvedt, & Smith, 1995).

We can apply a similar critique to the AEF’s Hypothesis 8b, which is that a large number of strong arguments can lead to attitude change under both low and high involvement. This is a reasonable statement supported by prior research, but once again this hypothesis ignores the dual process notion that the mechanisms and consequences of change are likely to be different under high- and low-involvement conditions. For example, in one study, Petty and Cacioppo (1984b) provided recipients with three or nine strong or weak arguments under high- or low-involvement conditions. For the strong argument conditions, the larger number of strong arguments that were presented, the more attitudes were positively changed under both low and high involvement. This seems to support the authors’ Hypothesis 8b.

However, the ELM holds that the mechanism for this similar-looking change was different. That is, under low involvement, adding arguments presumably produced more change because of heuristic reasoning. That is, people may have reasoned that the more arguments, the better the proposal must be. There is no need to engage in much thinking about the arguments to come to this conclusion. However, under high-involvement conditions, adding arguments

produced more change because the arguments were each processed carefully and their strength was realized. Although the effects for adding more arguments look the same under high and low involvement when the arguments are strong, the unique ELM prediction is that the change under high involvement is likely to be more consequential (e.g., producing more stable attitudes) than the same change under low involvement.

In addition to this differential strength hypothesis, the ELM holds that the effects of adding weak arguments is quite different under high- and low-involvement conditions. Specifically, Petty and Cacioppo (1984b) found that when the arguments were weak, adding more weak arguments under low-thinking conditions still produced more attitude change (the same effect as with strong arguments) because heuristic reasoning would still lead to the same conclusion—the more the better. However, under high-involvement conditions, adding more weak arguments did not lead to more persuasion. In fact, persuasion was reduced with more rather than fewer arguments, because when the arguments are processed carefully, their flaws are realized. This finding—less persuasion with more arguments—is not addressed by the AEF.

In short, because the arguments are not processed carefully under low involvement, it doesn't matter if the arguments are strong or weak; it just matters that many arguments are associated with a positive reaction to a message. However, because the arguments are processed carefully under high involvement, it matters a great deal if the arguments are strong or weak. So, we can say that the AEF prediction, though correct in some instances, does not speak to the mechanism by which change occurs and because of this does not appear to recognize that there are potentially different consequences of high- and low-involvement change. Finally, the AEF does not predict what happens when the arguments presented are weak. Thus, we continue to favor the dual process analysis of how simple cues and arguments impact attitudes.

Consistency as a Primary Motivational Force

In addition to making predictions about persuasion, the AEF emphasizes the importance of consistency as a human motive. Indeed, the need for consistency has been a dominant motive in the literature on attitudes for a long time (Abelson et al., 1968; for recent reviews, see Greenwald et al., 2002; Gawronski & Strack, 2012). However, although consistency is an important motivational force, it is not the only motive relevant to attitudes. Important to note, the AEF is silent about the many other motives that are also influential in guiding attitudes and persuasion, including knowledge, self-esteem, and social inclusion (see Briñol & Petty, 2005, 2018, for reviews).

The consistency motive is important in the AEF because the thinking inspired by the drive for consistency is said to reduce attitudinal uncertainty (entropy). Indeed, elaborating on information relevant to an attitude object for which a discrepancy exists can reduce uncertainty. Various prior

models of attitudes are in accord with this idea. Related to this point, we also agree that increasing thinking is an activity that is more likely for those attitude objects that people care about such as those connected to the self (Petty & Cacioppo, 1990). Although thinking is one key approach to reducing the unpleasantness that often comes from inconsistency, it is certainly not the only one. There are many other strategies that people use when dealing with inconsistency such as trivializing the discordant elements and others (for reviews, see Jonas et al., 2014; Proulx, Inzlicht, & Harmon-Jones, 2012; Van den Bos & Lind, 2002). Thus, as with the analysis of persuasion, the AEF analysis of consistency is incomplete.

Areas of Confusion

Before concluding our assessment, we comment on a few other areas in which we were somewhat confused by the predictions or analysis offered by the AEF. One such area had to do with the utility of implicit versus explicit measures of attitudes. The authors argue that implicit measures are more likely to tap attitudes in high entropy states than explicit measures. This seems to suggest that implicit measures tap into inconsistent and unstable attitudes, whereas explicit measures tap into more consistent and stable attitudes. This analysis was confusing because sometimes just the opposite case is made. That is some argue that implicit measures tap into clear, univalent, and long-standing attitudes (e.g., see Olson & Fazio, 2001, for a review), whereas others argue that explicit measures are highly subject to various contextual effects that can cause attitude reports to vary greatly from one setting to another (e.g., Schwarz, 1994).

In contrast to this link of the two kinds of measures with two kinds of attitudes, our view, in accord with other theorists, is that contemporary implicit measures such as the IAT (Greenwald, McGhee, & Schwartz, 1998) and evaluative priming (Fazio, Jackson, Dunton, & Williams, 1995) are capable of tapping into a relatively stable and consistent attitude, assuming one exists (e.g., as in the political domain). Explicit measures tap into the same underlying predisposition, but responses to explicit scales can be further modified by other factors such as concerns about the validity of the automatically activated attitude (e.g., Is this really my attitude, or is it a feeling from the culture?) or concerns about whether such a feeling should be expressed (i.e., social desirability concerns; e.g., see Petty, Briñol, & DeMarree, 2007).

Also, the authors predict that getting people to think to a greater extent should produce higher internal consistency and stability on implicit measures of attitudes. This prediction makes sense, but why confine the prediction to implicit measures? According to various studies on attitude strength, getting people to think can sometimes produce these same consequences for explicit measures (see Briñol, Petty, & McCaslin, 2009, for a review).

One intriguing prediction from the AEF related to enhanced thinking was the introduction of an “opposite mere thought effect.” The way this prediction was framed,

however (i.e., that when people are asked to answer attitude questions quickly, attitudes should be less polarized than when individuals are given more time), seemed to simply restate the standard mere thought effect that when people are given some time to think, attitudes should be more polarized than when they respond normally (cf. Tesser, 1978). For a truly opposite mere thought effect to occur, one would expect that attitudes should be *more* polarized when given a short (rushed) amount of time than a normal amount of time. This prediction would be intriguing if found.

One way this might come about is if attitudes possess some degree of ambivalence (inconsistency) in their normal state. If so, it would seem that rushing a response would make one or the other side of the inconsistency (positive or negative) more likely to be dominant, leading to more polarization than in a normal state where both sides would more likely be considered. Similarly, with enhanced thought, polarization might also occur as a result of the dominant side being reflected upon more than the nondominant side. Thus, the prediction would be for a curvilinear effect with somewhat inconsistent attitudes becoming more polarized in both rushed and high thought conditions compared to normal conditions (cf. Clarkson, Tormala, & Leone, 2011).

Another way to approach whether attitudes will be more or less polarized with thought is to consider the impact of validity tags for positivity and negativity as in the metacognitive model (MCM) of attitudes (Petty et al., 2007). In the MCM approach, implicit measures are thought to capture positivity and negativity without respect to validity tags, whereas explicit measures consider the impact of validity tags. In this sense, a rushed explicit measure would operate similarly to an implicit measure. According to the MCM, whether a rushed explicit measure would produce more or less polarized attitudes than a standard measure would depend on the nature of the attitude (ambivalent or not) and whether whichever evaluations came to mind were seen as valid or invalid. For example, consider a person who has considerable positivity (+7) and little negativity (−2) come to mind upon exposure to an attitude object. On a rushed explicit (or an implicit) measure, this person would score quite positively. But also assume that when responding to a normal (nonrushed) attitude measure, the person also retrieves the assessment that the few negative reactions are more valid than the many positive reactions that are retrieved. On a normal explicit measure, this person would report a less polarized evaluation than on the rushed measure. Other patterns can be predicted depending on the degree of ambivalence of the attitude and the presumed validity of any positive and negative components. The point is that existing research and theory paint a more complicated picture than does the AEF with its more limited parameters.

Conclusion

As we stated in opening our comment, there is much to admire about the AEF. In particular, there is a degree of precision and elegance in applying concepts from physics

(and thermodynamics in particular) to the study of attitudes. There is a cost, however, in terms of new terminology and jargon that must be mastered (e.g., “cusp catastrophe”), which would be worth it if several new insights were provided that were not previously available. However, it appears that a good number of the predictions derived from the AEF, though reasonable, are already available in the existing literature. For example, the (simplified) basic idea of the AEF is that attitudes can have varying degrees of inconsistency and that thinking about attitude objects generally reduces inconsistency by increasing the dependence (consistency) among the elements of the attitude system and that this thinking also results in more stable attitudes. We resonate to these ideas as they are quite compatible with numerous prior theories of attitudinal consistency and strength. However, these prior theories appear to offer a more nuanced perspective on these issues in that they deal with other methods of inconsistency reduction and other attitude strength consequences besides stability.

On the more positive side of the ledger, the AEF appears to make some novel predictions and this opens new areas of research. This is quite valuable. For example, the authors link the dependence parameter in the AEF to the threshold exponent in the graduate threshold model of ambivalence (Priester & Petty, 1996), but it is not clear if this prediction requires the AEF, and it remains to be seen whether this prediction like other novel predictions made (e.g., reverse mere thought) will be born out in future studies. Nonetheless, even if some of the predictions and novel ideas could have been generated from other frameworks, in some cases they were not previously generated, and thus the AEF has the potential to advance the attitudes literature.

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