J. R. Kantor and Behavior Analysis[1]

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Resumen

El presente comentario celebra el centésimo aniversario de la disertación de J. R. Kantor al describir la potencial relevancia de las ideas de Kantor en la ciencia del análisis de la conducta. En particular, se consideran: la filosofía de la ciencia de Kantor, descrito en su obra *Logic of Modern Science* (Kantor, 1953) y el sistema de la psicología descrito en su obra La Psicología Interconductual (1958, traducido al español en 1978). Después de más de 100 años, muchas de las ideas centrales del trabajo de Kantor siguen siendo relevantes e importantes para el continuo desarrollo de una ciencia natural del comportamiento.

Palabras clave: interconductismo, psicología interconductual, J. R. Kantor, análisis de la conducta, ciencia natural.

Abstract

The present commentary celebrates the 100th anniversary of J. R. Kantor's dissertation by describing the potential relevance of Kantor's ideas to the science of behavior analysis. In particular, Kantor's philosophy of science, as described in Logic of Modern Science (Kantor, 1953), and system of psychology, as described in Interbehavioral Psychology (Kantor, 1958), are considered. After more than 100 years, many of the ideas central to Kantor's work continue to be both relevant and important for the ongoing development of a natural science of behavior.

Keywords: interbehaviorism, interbehavioral psychology, J. R. Kantor, behavior analysis, natural science.

J. R. Kantor's (1888-1984) work focused on the development of a naturalistic philosophy of science (e.g., Kantor, 1945, 1950, 1953) and system of psychology (e.g., Kantor, 1958), including work on more specific topics within both of these broad areas (e.g., Kantor, 1947, 1982; Observer, 1984). As all of Kantor's work was pursued from a natural science perspective, it is closely related to other varieties of behaviorism, including the natural science of behavior known as behavior analysis. Unfortunately, few behavior analysts seem to have acknowledged this connection. Therefore, our plan in this brief commentary is to highlight some key areas of Kantor's work and to call attention to how they may be relevant to behavior analysis. Our aim in doing so is not to simply repeat arguments that have been made

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elsewhere, but to celebrate the legacy of Kantor's work on the 100th anniversary of his dissertation (Kantor, 1917), and to call further attention to the considerable potential Kantor's work has for the continued growth and development of behavior analysis. We of course acknowledge that our thoughts are derived from our own experiences as behavior analysts who have been heavily influenced by the work of J. R. Kantor. As such, we claim no absolute or ultimate truths (see Hayes, 1993). We begin by describing aspects of Kantor's work in the philosophy of science, followed by the science of psychology, and highlight specific implications for behavior analysis.

The Philosophy of Science

A considerable amount of Kantor's work addressed topics within the philosophy of science. His text, The Logic of Modern Science (LMS; Kantor, 1953) draws attention to several important issues in this area and we focus upon it here. In the broadest sense, LMS calls attention to what science is and is not. In doing so Kantor highlights that science is not about universals or absolutes (p. 3), and that science is, after all, a concrete activity that humans engage in. Looking at science in this way removes many of the assumptions that "science" often carries with it within the culture at large (e.g., that it is some sort of magical process, more on this below). In Kantor's words, "What science is can only be determined on the basis of the unique activities involved in determining a) the existence or non-existence of certain things and events and b) the characteristics of such things when they do exist." (1953, p. 4). Importantly, in these early pages of LMS Kantor also draws attention to issues that pertain to both disciplinary and interdisciplinary science (Kantor, 1953, p. 5). Specifically, Kantor suggests that there is not one science but rather sciences, and moreover, that there are both similarities and differences among the various areas of science. Sciences are similar in that they are both serious and original; "If the scientific enterprise is successful, something new emerges, something, moreover, frequently incompatible with previous conditions." (p. 7). Of course, specific disciplinary sciences are also distinguished from one another in various ways; in particular, each focuses on a unique feature of the natural world. In other words, the subject-matters of the disciplinary sciences, while derived from the same world of nature, are distinct.

While emphasizing that science is indeed an enterprise comprised of many concrete actions of humans, Kantor underscores the importance of examining the activities of scientists in more detail. Being that Kantor's primary aims were to promote a thoroughly naturalistic philosophy of science and system of psychology, Kantor was especially focused on the relationship between constructs and events throughout all of his work (e.g., Kantor, 1957). Consistent with his naturalistic aims, Kantor promoted the development and use of constructs that were derived from contacts with events, from contacts with the natural world. Moreover, following from this Kantor argued for the thorough removal of all constructs that were derived from cultural folklore, especially the numerous constructs that are products of the insinuation of dualism throughout common ways of speaking.[3] Still, remembering that science is an enterprise conducted by workers, Kantor reminds us that scientists are individuals, living and participating in the culture in various ways, and therefore they are inevitably influenced by cultural factors (i.e., mentalism). As such, it is incumbent upon the philosophy of science to pay special attention to the extent to which the work of scientists is derived from contacts with events relative to cultural folklore (Kantor, 1953, p. 26).

[3] The following note was found on Kantor's nightstand after his death: "No spirits, wraiths, hobgoblins, spooks, noumena, superstitions, transcendentals, mystics, invisible hands, supreme creator, angels, demons." (Kantor, 1984).

Furthermore, overlooking the inevitable influence of cultural assumptions on the work of scientists may only assure its enduring presence. In other words, a failure to explicitly acknowledge the inevitable circumstance of dualistic folklore influencing the work of science only prolongs the extent to which dualistic ideas will continue to flourish and insinuate themselves in all of our work.[4] Following from this, Kantor argues that the work of the logician, that of evaluating the work of scientists, is indeed a concrete scientific enterprise itself (p. 26). It has a concrete, observable subject-matter (the work of scientists) and is unique in its mission. Not only is the work of the logician a legitimate, scientific activity, but moreover, it is essential to the mission of natural sciences.

LMS not only clearly specifies the importance of the science of the philosophy of science, but also considers the role of empirical research in sciences. Here, Kantor underscores the great importance of research, especially as it is a primary means of contacting events in the natural world. In Kantor's words "Experimentation is the life of science" (1953, p. 99), and "To emphasize experimentation in science is to pay signal tribute to our constantly stressed interbehavioral principle that science proceeds on the basis of contacts with things and events." (p. 101). At the same time, Kantor reminds us that research is not "magic" (p. 107). That is, research involves descriptions of relationships among various factors in the natural world. Empirical research, of course, requires the thoughtful development of research questions and significant interpretation, among other things; research is not merely a ritual (p. 104). Kantor's chapter on experimentation reminds us that while research is an incredibly important aspect of science, it isn't the entirety of the scientific enterprise.

Finally, LMS also addresses specific issues with construct development in science in general and the science of psychology in particular. Kantor's chapter on construct development in psychology is especially noteworthy as it specifically points to the longstanding insinuation of dualism throughout the discipline. Indeed, Kantor notes that psychology has long faced the accusation that it couldn't be a science at all because it wasn't concerned with actual events (p. 250). LMS concludes with a chapter titled "Science and the Logic of Culture". Here Kantor considers the extent to which the sciences are integrated within the larger cultural context, and states that "As long as there is no thoroughgoing assimilation of the sciences with the other cultural components there is no comprehensive cultural system." (p. 315). In considering the integration of science into the larger cultural system a number of interesting topics are addressed, including the relationship between science and philosophy, religion, technology, and values.

Implications for Behavior Analysis

While we have certainly not provided a thorough overview of all of the ways Kantor's work in the area of the philosophy of science may contribute to the continued development of behavior analysis, we have called attention to some of the most critical issues. Most generally, no area of science is to be considered absolute and ultimate. This means that no area of science will ever be "finished", and moreover, that no one area or analysis will ever apply to everything. Related to this, we have found there to be several areas in behavior analysis that may rely on one particular analysis or another as though it were the analysis of a particular issue (e.g., Skinner's analysis of private events). Moreover, at times it may

[4] This is not to say that increasingly naturalistic sciences may not evolve as a function of the consequences they are associated with, that dualistic ideas may not slowly decrease due to their lack of utility over time (though this remains to be seen as dualistic ideas continue to flourish). Rather, we are highlighting the fact that removing dualism can be hastened, and progress fostered, with specific attention to and assessment of the assumptions of scientists.

even seem as though any critique of one particular analysis is seen as a critique of the entire enterprise. This clearly represents confusion as to the aims of science and to what any individual scientist will ever accomplish. Kantor's early pages of LMS remind us that science must always be evolving. When a science is assumed to be about absolutes and universals progress is stunted, evolution halted, and its eventual irrelevance assured.

Kantor's work in this area also has important implications for conceptualizing both disciplinary and interdisciplinary sciences, with potential implications for the science of behavior. In particular, we note the ongoing consideration of the relationship between behavior analysis and biological science, with behavior analysts often having varying opinions as to the nature of this relationship (e.g., Hayes & Fryling, 2009; Marr & Zilio, 2013). To Kantor, while the sciences may be similar in that they are all derived from the natural world, they are probably best not blended together or considered to be the same science. In other words, each science musty identify an area of special focus, a distinct subject-matter (more on this below), which is the foundation for a unique contribution. Behavior analysis has much to gain from more thoroughly and explicitly considering its relationship to other sciences, especially considering the extent to which behavior analysis aims to provide a unique contribution to the larger family of natural sciences.

Kantor's description of the work of the logician of science also has a number of potential implications. Indeed, as all scientific work is prone to influence from cultural sources the work of the logician of science is particularly important. Kantor's highlighting that such work is concrete scientific activity seems to question the common idea that critical philosophical work is somehow less important or less "real" than more common forms of empirical research. In addition, Kantor's explicit distinction between constructs and events, and description of proper construct development and use in natural science perspective is particularly helpful and relevant to many long-standing issues in behavior analysis (e.g., understanding the distinction between verbal and non-verbal behavior, operant and respondent conditioning, investigative and interpretive constructs, causality, and more). Consistent with this, behavior analysts may have a tendency to appreciate data and to question the extent to which ideas are "backed up" by research. While this tendency is probably rooted in good, anti-mentalism efforts, it may have the unfortunate side-effect of undermining the value of genuine scientific philosophical and theoretical activity, especially that conducted in natural science perspective. Kantor reminds us that while experimental research is surely important, it isn't everything (Kantor, 1969, 1970). Moreover, work in the area of theory and philosophy, especially of the sort Kantor describes, is not only important in its own right, but entirely essential to the aims and progress of natural sciences.

Psychological Science

Subject-Matter

While Kantor's work in the philosophy of science has many implications for behavior analysis, his contributions to the science of psychology also raise a number of important issues. Though much of Kantor's scholarly work in the area of psychology is noteworthy, his 1958 text Interbehavioral Psychology (IP) captures a number of topics. Kantor's IP is distinctive in a variety of ways; the mere usage of the word "interbehavioral" as opposed to "behavioral" highlights a unique feature of Kantor's approach. Consistent with the work of B. F. Skinner and other prominent behavior analysts, behavior analysts often

conceptualize the subject-matter of behavior science by emphasizing behavior, using common operant and respondent constructs. By contrast, Kantor's IP proposes the Psychological Event (PE; Kantor, 1958, p. 14) as a construct which orients us towards the subject-matter. As implicated by the term interbehavior, then, it is not merely behavior that is emphasized, but stimulation and responding as a unified, single occurrence (SF□□RF). In other words, that there is no responding without stimulation, and no stimulation without responding; there is only interbehavior. Kantor's PE stands in contrast to more common constructs in behavior analysis, constructs which often represent more linear ways of thinking. [5]

Kantor's construct of the PE emphasizes more than the function obtaining between stimulation and responding, however. The entire event is captured by the following formula PE = C(k, sf, rf, st, md, hi), where PE stands for the psychological event, C the integrated nature of all of the features of the event, k the uniqueness of each and every event, sf stimulus function, rf response function, st setting factors, md medium of contact, and hi interbehavioral history (Kantor, 1958). An important aspect of this construction is that there is no special emphasis placed on any particular aspect of the PE; no one factor more causal or influential than any other. As such, changing one aspect of the psychological event changes the entire event, and it is always the entire event that participates in psychological happenings.

Kantor also makes an explicit distinction between stimulus objects and stimulus function and the responding of the organism and response functions. Kantor's conceptualization of stimulus and response substitution especially highlights the implications of this distinction (e.g., Kantor, 1924, pp. 50-51; pp. 68-69). Specifically, Kantor's work describes how, through an organism's history of responding with respect to spatiotemporal association conditions, stimulus objects may develop the stimulus functions of other stimulus objects. For example, how a mention of someone's name can function as a psychological stimulus for a response of seeing a person's face or hearing something they once said. In this example, hearing the sounds of the person's name might be considered the direct, auditory stimulus, whereas the seeing of the person's face and hearing prior conversation involve substitute stimulus functions. Indeed, the substitute functions of the auditory stimulus involve responding (seeing and hearing) to absent stimulus objects. Such responding with respect to substitute stimulation (i.e., to absent stimulus objects) is considered response substitution in Kantor's system. This explicit distinction, between stimulus objects and stimulus functions, and responding and response functions, is distinct to Interbehavioral Psychology.

Importantly, stimulus and response functions do not exist alone, they participate in the previously described PE. As such, it is not the case that stimulus objects develop the substitute stimulus functions of each and every thing they have ever been associated with; it is not the case that "everything becomes everything", in other words. Rather, stimulus and response functions are context specific. That is, which particular substitute stimulus functions are actualized or not is a function of the unique configuration of the entire psychological event.

System Building

Kantor also describes a system building procedure in IP (1958, p. 48). Here, Kantor highlights that scientific disciplines are not entities that exist on their own. Rather, sciences are derived from

[5] It is not our perspective that operant and respondent constructs *always* involve linear ways of thinking. Indeed, operant and respondent constructs may be especially useful when used in an investigative context. Problems arise when investigative constructs are confused with the subject-matter of the discipline.

cultures, and they are therefore always influenced by those cultures. Given this, Kantor argues that specific assumptions regarding the philosophy of science must be articulated, distinguishing the philosophy of science from cultural folklore. Moreover, the metasystems of the various areas of science also warrant specific consideration and meta-assumptions (see pp. 66-67 on the assumptions of the metasystem of psychology). Finally, there are the specific assumptions that pertain to each individual scientific discipline. Kantor also suggests that sciences may be evaluated based upon their validity (i.e., internal coherence within individual sciences) and significance (i.e., external coherence within the larger field of the science). In other words, sciences are to examine the extent to which they are free from contradiction both within their own disciplinary system as well as the larger field of the sciences. Thus, system building involves not only the initial construction of assumptions at various levels, but also the ongoing assessment of validity and significance, and continued work in areas where validity and significance are found to be compromised. Kantor also addresses the comprehensiveness of scientific systems in IP; sciences should not only strive to be valid and significant, but to be comprehensive as well. This means that a scientific system should pertain to all of the events that fall within the purview of the subject-matter. Anything less than this would constitute a fractional system, a disciplinary system that only addresses some aspects of the subject-matter.

Kantor not only calls out the importance of developing explicit assumptions, but he actually articulates those assumptions in IP (and other places, e.g., Kantor & Smith, 1975); many assumptions (or "postulates") are described in IP. For example, regarding the philosophy of science (pp. 64-65) Kantor addresses construct development and the freedom from absolutes and universals, among other things. Metasystem assumptions (pp. 63-68) address the homogeneity of psychology with other sciences, the distinct features of psychology as a discipline, reductionism, and more. Finally, examples of specific assumptions pertaining to the science of psychology (pp. 77-82) involve the subject-matter, the participation of the whole organism in psychological events, and causality. In the absence of clear, explicit assumptions, disciplinary confusion may ensue. This can ultimately impact productivity, increase the likelihood of redundancy, and compromise the aims of natural sciences more generally. To be sure, Kantor argues for the development and organization of various assumptions for a specific reason; to protect science from cultural sources of influence.

Finally, it is important to note that Kantor's description of disciplinary sciences as systems is itself somewhat unique. Kantor notes that there are various subsystems of IP, and his IP text involves specific chapters on different subsystems. While this may not seem particularly distinctive, it clearly implies that topics such as investigation, interpretation, and application are indeed not to be confused with the entire system itself. In other words, at no point is one subsystem to be given more or less status than the others. When scientific disciplines are looked at as systems each of the areas within the system may be more likely to be valued by the discipline.

Implications for Behavior Analysis

Kantor's conceptualization of the PE has a number of implications for behavior analysis as the specific subject-matter of behavior analysis is not always entirely clear. For example, there are ongoing discussions and debates about the role of private events in a natural science of behavior (e.g., Marr, 2011), continued efforts to advocate for a molar perspective (e.g., Rachlin, 2013), and more. This invites

confusion and may jeopardize the ultimate contribution the science makes to the larger field of the sciences. Kantor's construction of the PE has much to offer the science of behavior in this regard. Kantor's PE also emphasizes that many things participate in psychological events, and that changing any of these factors results in changing the entire event. In doing so, researchers might consider examining a range of factors (e.g., setting conditions) in attempting to understand behavior. This feature of the PE may be contrasted with other attempts at constructing the subject-matter, where particular factors are held to be more or less influential than others. Indeed, the entire notion of function is looked at differently from the perspective of the PE.

Kantor's explicit distinction between stimulus objects and stimulus functions also has many implications for behavior analysis (e.g., DeBernardis, Hayes, & Fryling, 2014; Fryling, Johnston, & Hayes, 2011; Hayes, 1994; Parrott, 1984, 1986). One of the most challenging issues for behavior analysis has been the area of complex human behavior, such as imagining, perception, remembering, thinking, and more. Some behavior analysts may even believe these topics are simply unavailable for behavioral investigation, given their alleged private or otherwise biological status. Kantor's distinction between stimuli as objects and stimulus functions provides a foundation for the analysis of many under-researched topics in a straight forward manner, without resorting to either dualism or reductionism, staying true to the conceptualization of the subject-matter as a psychological event and keeping with natural science aims. Moreover, this way of looking at complex behavior lends itself to further behavioral investigation.

Kantor's system building procedure also has much to offer the science of behavior, especially his description of the validity and significance of scientific systems as a means of evaluating scientific systems. There are many issues within the discipline which compromise its validity, whereby significance among the larger field of the sciences may not be achieved. This, in addition to the metasystem assumptions pertaining to the comprehensiveness of scientific systems, points to many opportunities for Kantor's work to be integrated with more mainstream behavior analysis.

Finally, the explicit articulation of various postulates and assumptions within Kantor's psychological system is remarkable. A number of topics within behavior analysis and psychology more generally may be a result from a lack of clear assumptions (e.g., confusion surrounding the subject-matter). As we have mentioned, explicitly articulating assumptions also prevents disciplinary redundancy, increases the chances of making a contribution, and more. In short, this activity seems to be foundational to the goals of a natural science of behavior.

Conclusion

With pervasive natural science aims, the work of J. R. Kantor seems to have much to offer the discipline known as behavior analysis. Our aim in this brief commentary was to highlight some of the key areas of Kantor's work and underscore how Kantor's work is both relevant and complimentary to the goals shared by behavior analysts more generally. After more than 100 years since Kantor's dissertation we celebrate his career by continuing to call attention to the possible benefits of further integrating Kantor's work into the science of behavior analysis.

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