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REVIEW ARTICLE

Metacognition and Self-Regulation in James, Piaget, and Vygotsky

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Abstract This article investigates the intertwined constructs of metacognition and self-regulation as they emerge in the works and theories of James, Piaget, and Vygotsky. To coordinate this exploration, we use an interpretive framework based on the relation of subject and object. In this framework, James's perspective on metacognition and self-regulation is aligned with the Self, Piaget's with the other and object, and Vygotsky's with the medium or agency of language. We explore how metacognition and self-regulation function within the realm of human behavior and development as described in the works of each of these theorists. Key questions or issues that emerge for current research are outlined, and the limitations and benefits of each theorist's perspective vis-à-vis metacognition and self-regulation are discussed.

Keywords Metacognition · Self-regulation

Metacognition and self-regulation have become well established, although not necessarily well-defined, as valuable areas for educational psychology research (e.g., Dinsmore *et al*., this issue). Along the way, there have been efforts to clarify and ground such research by looking back to the roots of these constructs in one or another historically important theory or theoretical framework (e.g., Bråten 1991a, b; Brown 1987; Flavell 1992; Zimmerman 2001). Here we engage in a similar effort, looking at metacognition and self-regulation in the theories of James, Piaget, and Vygotsky. The work of these three foundational theorists, taken together, provides an integrated, complementary set of perspectives on the "incestuously related" (Brown 1987, p. 66) phenomena of metacognition and self-regulation. Rather than looking back to trace the roots of researchers' current uses of these constructs, we take these theorists as our starting place in order to pull out their insights into how metacognition and self-regulation develop and function in human beings, as viewed within

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each of their accounts of human behavior, learning, and development. The themes and issues that emerge from the consideration of these constructs in the theories of James, Piaget, and Vygotsky are intended to provide a clarifying and problematizing counterpoint to what emerges in the rest of this special issue from consideration of current research efforts.

Although this special issue is dedicated to the topics of metacognition, self-regulation, and self-regulated learning, our investigation here centers principally on the first two. Understanding metacognition and self-regulation as aspects of human behavior, learning, and development requires situating them within the broad context of all activities for humans of all ages and points of development, while self-regulated learning is, by most definitions, limited to students in academic contexts (e.g., Zimmerman 2008). For Vygotsky, as will be seen, the role of "scientific concepts" in the development of metacognition and self-regulation moves such academic contexts into a more central position.

We do not propose to give a detailed account of each theorist's work or even of metacognition and self-regulation for each theorist, but rather to pull out critical themes and issues. The discussion is organized by theorist and within theorist by construct, using primarily their own works as sources. In looking to the writings of these theorists, we looked both to key sources, those widely cited in overviews, as well as to those likely to target more specifically our constructs of interest. We have opted to dedicate a significant portion of our presentation to quotations from the authors as constituting the evidence to support our interpretation, which we offer as one possible view of these constructs within these authors' works.

Unifying Framework

Reducing three such comprehensive theories to a manageable size and shape is a critical first step in undertaking this investigation. An interpretive framework can perform much of this necessary work of compression without, it is hoped, oversimplifying or misrepresenting the richness and complexity of these three scholars' contributions. Such a framework allows us to pull together across the three theories what each offers that is unique and characteristic of the theorists' essential stances, while permitting fundamental congruencies to emerge as well.

We built our interpretive framework around the relation between subject and object. Knowing or acting involves a knower or actor, a medium or agency of the knowing or action, and what is known or acted upon. Table 1 depicts how we align these three theorists with regard to metacognition, very simply viewed as knowledge or awareness of self as knower, and self-regulation, viewed as control of or acting upon self as actor.

In this view, for James, metacognition and self-regulation are essentially activities of the Self. For Piaget, metacognition is essentially other-cognition, and self-regulation is essentially other-regulation. And for Vygotsky, metacognition and self-regulation are

Table 1 Alignment of Theorists in Relation of Knower-Medium-What is Known, Actor-Agency-What is Acted Upon, for Metacognition and Self-Regulation

	Interpretive Framework		
Metacognition:	Knower	Medium	Object of Knowledge
Self-regulation:	Actor	Agency	Object of Action
Theorist:	James	Vygotsky	Piaget
Orientation:	Self	Language	Other/Object

essentially verbal activities. Where one stands with regard to metacognition and self-regulation is a reflection or consequence of where one stands with regard to Self (for James), to knowledge of others and objects (for Piaget), or to the use of language (for Vygotsky). We view these theorists as primarily offering differences in perspective on the same underlying phenomenon, with the differences arising from what they take as fundamental in this relation. Further, we view them as offering perspectival differences that together provide a relatively consistent schema supporting investigation of the development and exercise of metacognition and self-regulation.

William James

Much of "modern" psychological theory was laid bare a century ago by James's exceptionally attentive process of introspection. As not a few scholars have noted, several themes in James's writings presaged the rise of explicit theories of metacognition and self-regulation processes (e.g., Crocker *et al*. 2004; Michel and Oyduk 2004; Pollio 1990; Son and Schwartz 2002). In a certain sense, James practiced metacognition and preached self-regulation. His self-investigations plumbed the depths of consciousness, attention, the Self, and will. Virtually all James's explorations in the nascent field of psychology were based on an *n* of 1, usually himself, and occasionally cases documented by his contemporaries. For James, control of attention is necessary for introspective observation, and self-awareness and self-knowledge are required for the deliberate mastery of behavior involved in development of functional habits; in this way, self-regulation and metacognition support and enable each other as nested in the Self.

Metacognition

Generally, James closely identified the Self with cognition. "Thoughts connected as we feel them to be connected are *what we mean* by personal selves" (James 1992, p. 154; emphases here and elsewhere are from the original text). His coining of the famous phrase "stream of consciousness" makes repeated reference to the Self. His choice of such phrases as "subjective life" emphasizes the active subject, and in particular the cognitively active subject (James 1992, pp. 158–159). Yet, for James, the Self, as viewed through the psychologist's lens, is not an entity per se; rather, "The thoughts themselves are the thinkers" (James 1992, p. 209). His "introspective observation" or deliberate attention to and reporting about one's own thoughts is a foundational metacognitive process involving both awareness and communicability: "*Introspective Observation is what we have to rely on first and foremost and always.* The word introspection need hardly be defined—it means, of course, the looking into our own minds and reporting what we there discover" (James 1890/91, p. 185). Another aspect of metacognition addressed by James is the distinction between the Self as knower ('I') and the Self as known ('Me'), and he further delineates the material, social, and spiritual constituents of the 'Me' (James 1992, pp. 174–175) as the subject matter of metacognitive knowledge.

James demonstrated "thinking about thinking" in his own deliberations over the nature of thought and such processes as perception, attention, association, and memory. In fact, he associates this awareness of one's own cognition with adulthood, thereby suggesting that in ideal development, such awareness becomes habitual.

> A mind which has become conscious of its own cognitive function, plays what we have called 'the psychologist' upon itself. It not only knows the things that appear

> before it; it *knows that it knows them*. This stage of reflective condition is, more or less explicitly, our habitual adult state of mind. (James 1890/91, pp. 272–273)

One of the limits of introspection, or metacognition, is that the sequences or processes of interest are not necessarily available to consciousness, either because they happen too quickly or because they occur without offering us direct perception of their existence. In his treatment of the Self, Will, and Habit, among other themes, James calls on brain-level processes to explain thought and behavior based on the grain size he can detect via introspection.

Self-Regulation

James's writings speak extensively to topics germane to self-regulation. It is James's continued emphasis on Habit and Will that we take up here in relation to the self-regulation and control of our own thoughts and behaviors. Self-regulation is essentially the inwardly directed activity of the Self in controlling attention and behaviors. This activity is either automated in the form of Habit, or requires effort in terms of Will.

For James, our daily life is bounded and permeated by automatic and habitual activity. "All our life, so far as it has definite form, is but a mass of habits—practical, emotional, and intellectual—systematically organized for our weal or woe, and bearing us irresistibly toward our destiny, whatever the latter might be" (James 1992, p. 750). James extolled the virtue of habit by explaining mental activity in terms of developing habits, and by exhorting teachers to inculcate habit in their young charges. The practical effects of habit are twofold. "First, habit simplifies our movements, makes them accurate, and diminishes fatigue... Secondly, habit diminishes the conscious attention with which our acts are performed" (James 1992, p. 140–141). The physiological held a prominent place in James's investigations into thought and habit. These translated into guidelines for education, and implicitly highlight a developmental path that demands rigorous training.

> The great thing, then, in all education, is to *make our nervous system our ally instead of our enemy*. It is to fund and capitalize our acquisitions, and live at ease upon the interest of the fund. *For this we must make automatic and habitual, as early as possible, as many useful actions as we can,* and guard against the growing into ways that are likely to be disadvantageous to us, as we should guard against the plague. (James 1992, p. 146)

James specifically appeals to teachers to promote in their students both a well-developed suite of adaptive habits and the capability of deliberately addressing their voluntary attention to right ideas.

> Thus are your pupils to be saved: first, by the stock of ideas with which you furnish them; second, by the amount of voluntary attention that they can exert in holding to the right ones, however unpalatable; and third, by the several habits of acting definitively on these latter to which they have been successfully trained. (James 1992, p. 818)

Education itself thus becomes the very process of deliberately acquiring habits, of controlling one's behavior in order to become free of the need to control it. "Education, in short, cannot be better described than by calling it *the organization of acquired habits of conduct and tendencies to behavior*" (James 1992, p. 730).

In his treatment of Will, James offers us insights that link the development of habit to voluntary action, and thus hold particular relevance for self-regulated learning, which would appear to require a decision on the part of the student to voluntarily enact strategies,

expend effort, and press forward in a given task despite the allures of competing attractions. For James, the foundation of volitional action is control of attention.

> *Volitional effort is effort of attention.* We thus find that we reach the heart of our inquiry into volition when we ask by what process it is that the thought of any given action comes to prevail stably in the mind... *The essential achievement of the will, in short, when it is most 'voluntary,' is to attend to a difficult object and hold it fast before the mind*. The so-doing is the *fiat*; and it is a mere physiological incident that when the object is thus attended to, immediate motor consequences should ensue. (James 1992, p. 417)

The chain of logic connecting thought and action, for James, was that an action (habit) is a sequence to be first triggered by holding an idea firmly in the mind, so that at the firing of action A (the first action of a habitual activity) action B is triggered, and so forth, until the entire sequence has been activated and implemented. With the initiation of A, the tipping of the first domino, the action is just a matter of physiological activity that no longer requires the will, or volition. James says the idea leads immediately to action in some cases, and in other cases requires a fiat. Once the fiat is granted, action follows immediately, and without interruption.

James asserts that we cannot have voluntary action unless that action has already been enacted by the person involuntarily, leaving a trace that can then be voluntarily trodden.

> [If], in voluntary action properly so called, the act must be foreseen, it follows that no creature not endowed with prophetic power can perform an act voluntarily for the first time.... When a particular movement, having once occurred in a random, reflex, or involuntary way, has left an image of itself in the memory, then the movement can be desired again, and deliberately willed. But it is impossible to see how it could be willed before. *A supply of ideas of the various movements that are possible, left in the memory by experiences of their involuntary performance, is thus the first prerequisite of the voluntary life*. (James 1992, p. 388)

For James, self-regulation is what the Self does in bending one's will to the actions necessary for formation of the appropriate habits, and to the selection and pursuit of appropriate habits.

Key themes and issues

A critical question that arises when considering James's discussion of self-regulation is the progression from the emergence of self-regulation as deliberate control of thoughts and behavior to habit. This suggests that the focus of efforts to promote self-regulation in students should take a longer-term view, and incorporate as well the subsidence of conscious self-regulation into automated habit. Introspection as a methodology raises the question of how to investigate the thinking of others with any degree of certainty, validity, or generalizability, and of how our understanding of the activity of metacognition and the processes of self-regulation might be limited or enhanced by this restriction of perspective and scope. How does what comes into view during introspection differ from what might be reported on a questionnaire or during a think-aloud? The presentation of internal mental activity as a stream of consciousness, including the seamless interaction of and flow between feeling and thought, raises questions regarding the validity of descriptions that are too precise, too stable, or too focused. Further questions include the problematic assertion

that any behavior must first be involuntarily enacted in order to be voluntarily produced, which would foreclose the possibility of observational learning, and the idea that once triggered by a fiat, an action will be carried through with no need for continued volition or will, and thus also no potential for deliberate interruption.

Jean Piaget

The extensive, systematic work of Piaget on human development and learning has been linked to contemporary research in metacognition and self-regulation (e.g., Brown 1987; Flavell 1992; Harris 1990; Pinard 1986). Aspects of Piaget's theory that have been seen as informative or problematic for current efforts include perspective-taking (Flavell 1992), access to one's own cognitive perspective and active versus conscious self-regulation (Brown 1987), the self-regulatory role of private speech (Harris 1990), and the role of cognizance in self-regulation and the development of metacognitive knowledge (Pinard 1986).

For Piaget, development proceeds via the restructuring mechanisms of assimilation and accommodation in a repeated movement away from and back toward equilibrium, with a key process being decentration (Piaget 1964/1968). Piaget's theory of development is built on evidence obtained from observations of children's spontaneous speech and interactions as well as from the behaviors observed and explanations offered during spontaneous or constructed problem-solving situations that reveal the signature characteristics of different stages of development. Progress through developmental stages requires awareness of, interaction with, and attempts to control both objects and others in the environment (Piaget 1964/1968), and full development of metacognition and self-regulation involves this same progression. There is no privileged access to knowledge of one's own internal environment; one's epistemic status as a knower of the world or of others will be where one stands as well in relation to knowledge and control of one's own thoughts and intentions. For Piaget, metacognition and self-regulation are fundamentally knowledge of and control of other and object, a viewing of one's own thoughts and actions as having the same position and following the same rules as relations with these external realities.

Metacognition

In Piaget's work, metacognition, that is, knowledge of one's own thoughts and thought processes, involves both conscious awareness and the capability of communicating one's rationale. These require a relativistic framework in which one's own perspective, reasoning, and actions are positioned as one of many possible perspectives and competing lines of reasoning or courses of action.

> for the understanding of other people as well as for the understanding of the outside world, two conditions are necessary: (1) consciousness of oneself as a subject, and the ability to detach subject from object so as not to attribute to the second the characteristics of the first; (2) to cease to look upon one's own point of view as the only possible one, and to co-ordinate it with that of others (Piaget 1959, p. 277).

Metacognitive thought, that is, thought that can be directed by the thinker, is conscious, intentional, intelligent, logically or empirically falsifiable, and verbally communicable.

> Directed thought is conscious, i.e., it pursues an aim which is present to the mind of the thinker; it is intelligent, which means that it is adapted to reality and tries to

> influence it; it admits of being true or false (empirically or logically true), and it can be communicated by language. (Piaget 1959, p. 43)

In addition, Piagetian formal operations presuppose metacognition, in that they require the ability to think about one's own thoughts.

> What, in effect, are the conditions for the construction of formal thought? The child must not only apply operations to objects—in other words, mentally execute possible actions on them—he must also "reflect" these operations in the absence of the objects which are replaced by pure propositions. This "reflection" is thought raised to the second power. Concrete thinking is the representation of a possible action, and formal thinking is the representation of a representation of a possible action. (Piaget 1964/1968, p. 63)

Arrival at metacognitive thought involves transforming the child's social and intellectual epistemic egocentrism into the adult's decentered, relativistic, and socialized thought.

> For the subject, release from his egocentrism will therefore consist ... in uncentring himself and in being able to dissociate the subject or the object: in becoming aware of what is subjective in himself, in being able to find his true place in all possible circumstances and thereby to establish between things, people, and his own self a system of common and reciprocal relationship. Ego-centrism is thus in opposition with objectivity in so far as objectivity signifies relativity on the physical plane and reciprocity on the social plane. (Piaget 1959, p. 271)

Aspects of the child's experience that drive this transformation include the necessity for activity and action, the role of others, including both peers and adults, and the part played by language.

Action on objects in the environment (and particularly unsuccessful action, which stimulates reorganization) leads to self-consciousness: "The subject only learns to know himself when acting on the object, and the latter can become known only as a result of the progress of the actions carried out on it" (Piaget 1976, p. 353). It also underlies the development of the capacity for explicit articulation of justifiable courses of action or lines of reasoning: "Thus cognizance, starting from the periphery (goals and results) moves in the direction of the central regions of the action in order to reach its internal mechanism: recognition of the means employed, reasons for their selection or their modification en route, and the like" (Piaget 1976, p. 334).

Our encounters with other people can support the development of metacognition in several ways. Others, peers in particular, can serve as objects of comparison.

> a subject who is centered on his own actions has no reason for becoming aware of anything other than their results; decentration, on the other hand, in which an action is compared to other possible actions and particularly to those of other people, leads to an onset of awareness of "how" and to operations. (Piaget 1962/1999, p. 252)

Others can also serve as object of our intentions, as we strive to influence them so as to achieve our own ends: "my claim...is precisely that cooperation—at the level of cognitive relationships between individuals—teaches us to speak 'according to' others and not simply 'according to' our own point of view" (Piaget 1962/1999, p. 249). Peers work particularly well in this role. And finally, others serve as communicative partners in exchange of speech: "Never without the shock of contact with the thought of others and the effort of reflection which this shock entails would thought as such come to be conscious of itself"

(Piaget 1928/1959, p. 144). Such use of language as a communicative vehicle plays a critical role in the child's progression toward consciousness and knowledge of his own thoughts and thought processes: "In fact, thought becomes conscious to the degree to which the child is able to communicate it" (Piaget 1964/1968, p. 19).

Four turning points mark the progress toward self-consciousness and knowledge of one's own thinking. The first is when the child begins to communicate verbally; language supports socialization and the internalization of thought and action. A second comes at around the age of 7, when the child's thinking becomes deliberately directed outward, in seeking to communicate with and understand others: "the effort to understand other people and to communicate one's thought objectively does not appear in children before the age of about 7 or 7 1/2." (Piaget 1959, p. 126). At the same time, the child's thinking also becomes deliberately directed inward, seeking to understand and communicate with itself about itself: "up to the age of 7, introspection seems to be completely absent, and ... from 7–8 until 11–12 there is a consistent effort on the part of thought to become more and more conscious of itself" (Piaget 1928/1959, p. 143). At the age of 11 or 12, another turning point occurs when the child moves into thinking characterized by formal operations or hypothetico-deductive reasoning. Now the child becomes capable of metacognition in the sense of awareness of and reflective knowledge regarding her own thoughts and thought processes. The effort now is to systematize this knowledge by organizing it around the rules of logic. The final turning point comes with adulthood, when the adolescent, having passed through 'metaphysical egocentricity' (Piaget 1964/1968, p. 64) and explored the possibilities when the only bounds are those of logic, returns to a reconciliation with reality, in which the abstract systems developed are tuned by accommodation to the world, to others, and to the self as they really are.

Self-Regulation

Self-regulation, or deliberate control of one's thoughts and actions, appears in two guises in Piaget's work. Piaget divides reason into the components of intellect and affect (Piaget 1964/1968), and self-regulation has a place in both of them.

> There is a constant parallel between the affective and intellectual life throughout childhood and adolescence...All behavior presupposes instruments and a technique: movements and intelligence. But all behavior also implies motives and final values (goals): the sentiments. Thus affectivity and intelligence are indissociable and constitute the two complementary aspects of all human behavior. (Piaget 1964/1968, p. 15)

In the intellectual realm, self-regulation takes the form of intention, the deliberate direction of thoughts and problem-solving actions. With regard to affect, self-regulation takes the form of will, or control of one's desires and emotions.

Self-regulation undergoes a parallel course of development in both of these realms, as children become capable of directing their own thoughts and actions and of regulating their own desires and emotions. Children move on the one hand toward directed, socialized thought in the form of logically governed intelligence, and on the other hand toward directed, socialized desires in the form of morally governed will: "Logic is not co-extensive with intelligence, but consists of the sum-total of rules of control which intelligence makes use of for its own direction. Morality plays a similar part with regard to the affective life" (Piaget 1950, p. 405). Logic provides the rules of thought while morality provides the rules for feeling; intention and will are the self-regulatory vehicles bringing thought and action, emotion, and desire in line with these rules.

Self-regulation of the intellect codevelops with metacognition. The degree to which the child can organize and systematize her thinking about the world and perceive other perspectives and other possible realities will similarly be the degree to which she can organize and systematize her thinking about her own thinking and perceive and choose among multiple possible courses of action. Thus, the transformative movement toward mature intellectual self-regulation is essentially the same development as that seen above for metacognition, and requires in the same way both cooperative and verbal interaction with others and physical interaction with objects in order to be realized.

Self-regulation of affect follows the same developmental path, but is more closely linked to interactions with others; interactions with objects play a less critical role here.

> The control characteristic of sensori-motor intelligence is of external origin: it is things themselves that constrain the organism to select which steps it will take ... Similarly, it is persons external to him who canalize the child's elementary feelings; these feelings do not tend to regulate themselves from within. (Piaget 1950, p. 405)

Self-regulation of affect requires the same development of perspective-taking as does intellectual self-regulation, but the need is for achievement of relativism and decentration in awareness of others' feelings and desires rather than of their thoughts or perceptual standpoint.

Interactions with adults and with peers function differently in how they promote the child's development of self-regulation. Children and adults are on different social and intellectual planes, where an adult has both power and knowledge that a child does not: "The adult is at one and the same time far superior to the child and very near to him. He dominates everything, but at the same time penetrates into the intimacy of every wish and every thought" (Piaget 1959, p. 257). Peers, however, provide appropriate comparison points, require persuasion and explanations, and interact cooperatively rather than coercively:

> The playfellow ... is like him because he is his equal in what he can do and in what he knows. But he is very different just because, being on the same level with him, he cannot enter into his most intimate desires or personal point of view as a friendly adult would. The child thus becomes socialized with his contemporaries in quite another way than with the adult. (Piaget 1959, p. 258)

Interaction with peers is particularly essential for the development of mature, autonomous morality. Adults introduce the child to morality, but the imbalance of power and knowledge makes this morality coercive in character, a morality of constraint. Through playing games and other forms of peer interactions, children develop the more advanced morality of cooperation.

> cooperation and social constraint deserve to be far more sharply contrasted than they usually are, the latter being perhaps nothing more than the pressure of one generation upon the other, whereas the former constitutes the deepest and most important social relation that can go to the development of the norms of reason. (Piaget 1950, p. 100)

Cooperation, the freely chosen coordination of behavior and mutual subordination of desires to a common goal, engenders the initial consciousness of what will eventually become systematized as morality, that is, the rules of "right" behavior, just as logic is the rule of "right" thinking.

> Society is the sum of social relations, and among these relations we can distinguish two extreme types: relations of constraint, whose characteristic is to impose upon the

> individual from without a system of rules with obligatory content, and relations of cooperation whose characteristic is to create within people's minds the consciousness of ideal norms at the back of all rules. (Piaget 1950, p. 402)

In the same way, although there is a place in intellectual development for the handing down of authoritative knowledge representing the cumulative wisdom of society thus far, achievement of mature intellectual self-regulation and metacognitive consciousness requires as well peer interaction, some measure of autonomy, and free experimentation.

> It is idle, again, to try and transform the child's mind from outside, when his own taste for active research and his desire for cooperation suffice to ensure a normal intellectual development. The adult must therefore be a collaborator and not a master, from this double point of view, moral and rational. (Piaget 1950, p. 412)

Key themes and issues

Several themes and issues of interest for contemporary discussions of self-regulation and metacognition emerge from the consideration of these constructs in Piaget's theory. In this description, metacognition and self-regulation mirror one's overall mental stance toward others and toward the world. Piaget notes that egocentrism "survives in adults in all circumstances where they are still dominated by spontaneous, naïve and consequently infantile attitudes" (Piaget 1959, p. 267). What would such circumstances be? In addition, how does this circumstantial egocentricity jibe with our understanding of how one *has* a mental perspective, if it is something that can come and go in different situations? Given the important role of language, does level of facility with language reflect or causally shape level of metacognition and self-regulation? What about possible roles of other individual differences?

His projected developmental trajectory in which adolescence marks a dramatic change in which children finally become metacognitive and self-regulating invites questions as to interventions promoting progress toward this point. Would interventions addressing how children know and view others and objects have effects also on their capabilities in terms of metacognition and self-regulation? Investigations of what younger children can do in the way of metacognition and self-regulation must take into account that what children report cannot be interpreted as equivalent to what adults would report in the same situation. The importance of play and cooperative activity, of interaction with objects, and of the differing roles of peers and adults open avenues of investigation with regard to the design of education. Children learn naturally from interacting with their peers, but what kind of experiences or training would be required to prepare adults to be appropriate fillers of the role that Piaget describes for them? Another consideration would be appropriate design of education for adolescents that incorporates both development of systematic abstract and imaginative thought and application of that thought to real, concrete specifics, so as to foster mature metacognition and self-regulation. Finally, how separable is self-regulatory capacity with regard to the intellect and to the emotions and should we aim at interventions to develop both?

Lev Vygotsky

The relevance of Vygotsky's work for research on metacognition and self-regulation has often been noted (e.g., Bråten 1991b; Brown 1987; Harris 1990; McCaslin and Hicky 2001;

Wertsch 2008). Identified points of relevance include other-regulation and internalization of social processes (Brown 1987); the self-regulatory role of private speech (Harris 1990); the role of self-awareness, self-regulation and knowledge of cognitive processes in development of cognitive self-control (Bråten 1991b); classroom models of co-regulated learning (McCaslin and Hicky 2001); and the transition from other-regulation to self-regulation (Wertsch 2008).

Vygotsky views human psychological development as historically situated and culturally determined. As human beings we are born already immersed in an evolved society that uses conventional tools and signs. Development proceeds through the internalization of social interactions, with the fundamental social interaction being interaction through language.

This internalization promotes increasing abstraction, which moves to the level of conscious abstractions or scientific concepts during the social institution of school instruction, in which culturally developed bodies of systematized knowledge are introduced. Metacognition and self-regulation, the awareness, knowledge, and control of thoughts and behavior, move along this same developmental path, in which change proceeds via qualitative transformations toward mature reflective awareness and deliberate control. This reflective awareness and deliberate control are exactly the internalization of language-based social interactions with others. Vygotsky's developmental methodology typically involves investigation at the border of internal and external, unearthing these internalized symbolic psychological tools and social relations by means of increasingly difficult tasks requiring goal-directed and tool-mediated action, in which self-directed speech reveals participants' control of their attention, thoughts, and actions. The activity of language use is for Vygotsky essentially what it means for thought to be conscious, capable of self-direction, and capable of knowing itself in a systematic way.

Metacognition

Metacognition appears in Vygotsky's work primarily in the sense of consciousness, which requires abstraction and controlled attention: "We use consciousness to denote awareness of the activity of the mind—the consciousness of being conscious" (Vygotsky 1986, p. 170). For Vygotsky, metacognition and self-regulation are completely intertwined; the intentionality implied by self-regulation requires consciousness and the control required for consciousness implies self-regulation. A further aspect of metacognition is awareness of the structure of one's own thought processes and of how to direct and control one's thoughts by the use of signs. This metacognitive knowledge, the basis of the mature capacity for reflective abstraction, is required for the formation of systematized concepts through mental manipulation of concepts using language. Another form of metacognitive knowledge mentioned by Vygotsky is the knowledge of one's own mental powers, particularly considered in relation to a given task. Adults have this knowledge, while children do not yet.

> The fact that children would unhesitatingly accept the challenge of establishing a complex choice response to as many as ten stimuli suggests that they do not yet know their own capacities and limitations. They operate with complex tasks in the same way they operate with simple ones. (Vygotsky 1978, pp. 70–71)

Another aspect of the knowledge of one's own mental capacity is the awareness of self as actor and as subject presumed in the use of inner speech for self-direction. Internalization of the directive and indicative speech used by others and then toward others and objects that becomes inner speech, or "thought itself" (Vygotsky 1981a, p. 188), implies an inner self that knows itself somehow as both obedient, attentive listener and commanding, indicating speaker.

For Vygotsky, the capacity for metacognition is not achieved until adolescence, at which point reflective abstraction and thus concept formation become possible: "Only the mastery of abstraction, combined with advanced complex thinking, enables the child to progress to the formation of genuine concepts" (Vygotsky 1986, p. 139).

> The development of the processes that eventually result in concept formation begins in earliest childhood, but the intellectual functions that in a specific combination form the psychological basis of the process of concept formation ripen, take shape, and develop only at puberty. (Vygotsky 1986, p. 106)

Children master the rules for directing their own attention, thought, and behavior and internalize this direction in the form of verbal self-stimuli. But this mastery does not become fully conscious until the child becomes capable about thinking about the rules herself, which means thinking about her own thinking. "The schoolchild, though growing steadily in awareness and mastery of such functions as memory and attention, is not aware of his conceptual operations. All the basic functions become 'intellectual' except the intelligence itself" (Vygotsky 1986, p. 167).

Exposure to school tasks and the repeated practice they provide promotes the development of metacognitive knowledge about one's own thinking. "In order to understand that after repetition it is easier to remember, one must be experienced in memory tasks" (Vygotsky 1981a, p.181). The generalization and abstraction required for the intellectualization of intelligence are not achieved until adolescence, and require the exposure to scientific concepts provided by school instruction.

> School instruction induces the generalizing kind of perception and thus plays a decisive role in making the child conscious of his own mental processes. Scientific concepts, with their hierarchical system of interrelation, seem to be the medium within which awareness and mastery first develop, to be transferred later to other concepts and other areas of thought. Reflective consciousness comes to the child through the portals of scientific concepts. (Vygotsky 1986, p. 171)

Having achieved this capability for systematization and abstraction, the developmental task for the adolescent is to then bring this abstracted consciousness to bear on specific concrete situations, that is, to transfer back from the general and abstract to the specific and concrete aspects of a particular situation. "The greatest difficulty of all is the application of a concept, finally grasped and formulated on the abstract level, to new concrete situations that must be viewed in these abstract terms—a kind of transfer usually mastered only toward the end of the adolescent period" (Vygotsky 1986, p. 142).

Social interactions with others and particularly with adults are the vehicle for exposure to scientific concepts in instruction and for participation in the directive, indicative, and communicative functions of language which then become internalized. An additional activity promoting metacognitive development is imaginative play. "From the point of view of development, creating an imaginary situation can be regarded as a means of developing abstract thought" (Vygotsky 1978, p. 103). In play, the child moves away from the actual situation, giving objects meanings and assigning the overall activity a self-generated purpose.

Self-Regulation

Self-regulation and the metacognition that supports it are central to Vygotsky's account of historically situated and culturally determined human behavior and development driven by

the internalization of language-based social interactions. For Vygotsky, self-regulation takes the form of deliberate control of one's own attention, thoughts, and actions; it is an essential characteristic of human behavior achieved by means of the social force of systems of stimuli.

> at the higher developmental stages of nature, humans master their own behavior; they subordinate their own responses to their own control. Just as they subordinate the external forces of nature, they master personal behavioral processes on the basis of the natural laws of this behavior. Since the laws of stimulus–response connections are the basis of natural behavioral laws, it is impossible to control a response before controlling the stimulus. Consequently, the key to the child's control of his/her behavior lies in mastering the system of stimuli. (Vygotsky 1981a, p. 175–176)

Voluntary attention is the most basic form of self-organization of behavior; the ability to direct our mental focus toward a given situation, aspect, or task, is presupposed in all other forms of self-directed activity.

The development of voluntary attention, control of thoughts, and control of actions proceed along parallel paths, all involving the internalization of language-based social interactions. There is a progression from basic control of attention to the new mechanisms involved in control of behaviors and then to those involved in control of thoughts, reflecting the progressive internalization and abstraction of language functions. The deliberate control of one's own thoughts, which is paired with the capacity for reflective abstraction, also requires exposure to scientific concepts and school-based instruction, and is not achieved until adolescence. "Learning to direct one's own mental processes with the aid of words or signs is an integral part of the process of concept formation. The ability to regulate one's actions by using auxiliary means reaches its full development only in adolescence" (Vygotsky 1986, p. 108).

Vygotsky outlines three basic stages of development for voluntary attention; similar stages are involved in the development of control of one's own behavior. The child moves from having her attention directed by adults by means of the indicative function of words, to being able to direct the attention of others, again by means of understanding and using the indicative function of words, to being able to direct her own attention by the use of verbal stimuli, at first external in the form of private speech, and then internalized as inner speech and thought.

> the development of a child's attention, from the very first days of his/her life, takes place in a complex environment that consists of double-valued stimuli. On the one hand, things, objects, and phenomena attract the child's attention; on the other hand, corresponding stimuli in the form of hints (indication) carried out by words direct the child's attention. Hence, from the very beginning, the child's attention is controlled attention. But this attention is initially controlled by adults, and only with the gradual mastery of speech does the child begin to master the primary process of attention, first, in relation to others, and then, in relation to himself/herself. (Vygotsky 1981b, p. 219)

The interactions with adults and others that drive the development of self-regulation initially occur spontaneously, in the context of the home environment. But the context of school also plays an important role. The types of tasks which students perform in school, the systems of socially constructed stimuli to which they are introduced, and the introduction to scientific concepts are all critical for deliberate control of behavior and actions. Play also plays an important role in the development of self-regulation. It provides

a powerful positive affective connection to the experience of controlling one's own behaviors and responses.

> Play continually places demands on the child to act against immediate impulse. ... A child's greatest self-control occurs in play. He achieves the maximum display of willpower...Ordinarily a child experiences subordination to rules in the renunciation of something he wants, but here subordination to a rule and renunciation of action on immediate impulse are the means to maximum pleasure. (Vygotsky 1978, p. 99)

Key themes and issues

Several themes and issues of relevance for contemporary research on self-regulation and metacognition arise from our consideration of Vygotsky's theory. If mastery of a specific set of stimuli is required for deliberate control and reflective abstraction related to a given function, such as mathematics, does this produce compartmentalization and separate development of these functions? Vygotsky suggests otherwise (1986, p. 186), but the function-specific nature of the stimuli and the need for repeated practice and exposure make this problematic. For Vygotsky, children's development of metacognition and self-regulation begins with the internalization of their interactions with others in the home context. How much does it matter if the home contexts differ from each other or offer different types of language-based interactions or different cultural environments than those around which the school experience is structured? Another question regards the role of asking questions and help-seeking as part of the process of learning to become self-directed, particularly as involving conscious awareness of one's own mental powers and how they align with the demands of a given task situation. If asking help of others and of adults is an essential form of external behavior that then becomes internalized, the design of scaffolding for children's learning experiences must be careful not to foreclose that possibility. The degree to which computers can provide appropriate scaffolding is a further question. Do children experience the use of language in communicating with computers in the same way as communication with people? Incorporation of play into education for younger children and of opportunities to transfer from the abstract back to the concrete for adolescents might be potential interventions promoting successful development of metacognition and self-regulation. That development is culturally determined involves children becoming socialized into the culture transmitted by adults and the educational system; the promotion and control of a separate 'youth' culture by marketers might be a concern in this regard.

Conclusions

Here we would like to discuss briefly how each theorist's perspective, as outlined in our interpretive framework, might shape the nature of our understanding of metacognition and self-regulation. The perspectives offered by these theorists on metacognition and self-regulation bring with them both benefits and costs in terms of what is investigated, how it's investigated, and what the goal of development (and thus of education) is seen to be. We see across all three theorists that metacognition and self-regulation are parallel and intertwining constructs that are clearly distinct yet mutually entailed both developmentally and in their functions in human thought and behavior. Neither subsumes nor subordinates the other. We also see valuable emphases within each theorist's discussion of metacognition and self-regulation. For James, we would like to point to the functional role of habit; for

Piaget, to the need for peer-level interaction; and for Vygotsky, to the role of formal schooling in the development of higher, culturally determined mental functions.

Adopting James's view of the relation of knower and known, actor and object through the lens of the Self has a number of ramifications. The method of investigation is restricted to introspection: the only way to explore how the self knows itself and acts upon itself is by looking inward (as a developmentally mature adult) to that knowledge and activity. This presents potential difficulties with regard to discrimination of multiple, simultaneous functions or attributes of metacognition or self-regulation within the unified stream of consciousness. Investigating the full range of qualitative developmental changes in metacognition or self-regulation also becomes problematic. Without an essential link to others, to the world of objects, or to the mediation of language, difficulties arise in translating effectively from one's immersed self-experience to a public, shared understanding. On the other hand, starting from the experienced Self brings together intellect and affect, thought and will. One's experience of oneself as a thinker, actor, and learner is the whole package—feelings, motives, and thoughts. There is a sense in which you know yourself very differently than you know anything or anyone else; James brilliantly captures the intimacy and variety of the experience of an individual Self.

Within Piaget's perspective, we get at how people know and control themselves primarily by looking at how they know and control others and objects, in terms of what they do and how they explain themselves to us. Our knowledge of the development of metacognition and self-regulation is built from the outside in. However, there may be critical aspects of these constructs that resist observation with this methodology, such as on-line monitoring processes, or that are misinterpreted by imposing the inferential assumptions required to get from actions and explanations to metacognition and self-regulation, such as cross-cultural differences. That we construct our own internal environment by reference to the external world and to others means that for Piaget, insofar as we know ourselves, we are also able to know the world and to know others. We escape the boundaries of the Self, and it becomes possible to know about how other people think and about the nature of physical reality. However, it is difficult from this point of view to reassemble the experienced Self as a unity, both at a given point in time and as having a persistent identity over time. We achieve differentiation and articulation of aspects of the Self as knower and actor but in some ways lose grasp of the whole and of the constant coordination of intellect and affect in all human behavior.

Vygotsky's perspective centers attention on the internalization of language-based interactions as the medium by which behavior is controlled and consciousness and abstraction achieved, so that the natural functions of perception, memory, attention, and will are transformed into higher, cultural functions. Our understanding of the development of metacognition and self-regulation depends here on what is elicited in terms of use of self-directed language and of psychological tools. Potential difficulties with this perspective and methodology include the tension between cultural specificity and human generality, the top-down nature of cultural shaping of development, the strong agentic role for adults and teachers as transmitters of culture, the emphasis on transitional points of development at the possible expense of understanding of typical behavior, and somewhat of a loss of a sense of what it means to be an individual actor. On the other hand, we gain a sense of the real power of language, and of how being able to know and control oneself grows out of one's own individual history of language-based social interaction as well as resting upon man's historical development of cultural tools.

Metacognition and self-regulation ground your conscious experience of yourself as knower and actor. With James, you are at home in the Self, with Piaget, you are at home in

the world and with others, and with Vygotsky, you are at home in language. Each provides a way of considering what it means to "be at home" as a human being, and centers human development around a different core outcome. These different developmental goals imply differences in the potential aim of education. For James, education might best foster individuality and self-fulfillment. For Piaget, collaboration coupled with autonomy might be the goal. For Vygotsky, education might support cultural progress, through mastery of existing cultural tools and openness to the development and use of new modes of language activity and new tools. How one is aligned in terms of what is taken as fundamental in the relation of subject and object when considering metacognition and self-regulation has theoretical, methodological, and educational implications. This brief consideration of the work of James, Piaget, and Vygotsky has arrived at a number of such implications. More extensive consideration of their theories would undoubtedly be informative, as might be the application of this framework and identification of these perspectives in current research.

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