The Working Mind

Meaning and Mental Attention in Human Development

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Appendix: On Metasubjective Task Analysis (MTA)

Throughout the book we present process/task analyses. These are operative models of thinking processes, done "from within"; that is, from the perspective of thinking processes themselves as the person copes with a task. A *metasubjective task analysis* (MTA) is an explicit model representing these analyses. Such models facilitate attention during analysis and lighten analysts' working memory load—as readers who use the notation will notice. Our logical notation for MTA is analogous in its qualitative function to what high-level programming languages do, or what notational calculus does for mathematical-physics analysis, although our notation is informal and its meaning is qualitative and concrete.

We represent sets and sequences of schemes of various sorts, which represent how task processes reach for a solution or attempt one. The task analyst in MTA must know concretely the sort of task analyzed to provide suitable representation and interpretations. A superordinate *operative* (OP) applies to *figuratives* or *operatives* placed inside the adjunct parentheses OP(…); parentheses demarcate scope of application for the superordinate operative they are attached to.

In any MTA formula, active concrete processing during the task begins with the *rightmost operative processes*, represented in the formula (proceeding from right to left in the formula's sequence). This is so because rightmost schemes in the formula are the most concrete, whereas leftmost schemes are more abstract and usually superordinate. This right-to-left order of applying operations during task-solution processes complements the convention that all *operative schemes in the formula apply to the schemes to their immediate right* (schemes within their scope of application being marked by the parentheses enclosure). Whereas the control function of schemes by other, more abstract, superordinate schemes moves from left to right in the formula sequencing, the abstraction level of schemes moves in the formula from the right to the left direction—schemes to the right being more concrete. When a rightmost process has been completed, the

resulting subjective process (symbolized in the formula's complex) will tend to be retained by the subject and held in his or her mind (within mental attention—i.e., *M-centration*), as the next-left operative process is enacted during the task. This continues until, from right to left, the whole formula has been implemented to produce an action/representation result (good or bad).

We explain here key notational conventions used in the book. We define various optional symbols that can be used in MTA formulas. Analysts could design and use other symbols; these are the ones we have used. MTA formulas are best kept as simple as possible, and many symbols described below are used rarely. To give these rules more generality, no specific content schemes are used in this presentation. Notational rules are presented generically on types of schemes (OPERATIVE or OP, figurative or fig1, fig2 … etc.). Unrepresented schemes are simply replaced by suspension points. In these definitions, *X* and *Y* stand for schemes or scheme-formulas of any kind. The sign (:=) means "equal by definition."

Task-Analytical Notation

OPERATIVE := Operative scheme; uppercase notation is used to name any operative.

OPERATIVE(…) := Operative schemes always apply on figurative, operative, or parameter schemes that are to their right and within the scope of the parentheses next to them (suspension points stand here for schemes). For operative schemes, parentheses demarcate scope of application.

figurative or ***figurative** or **figurative*** := figurative scheme. Lowercase notation is used to signify figurative schemes (of any sort and complexity). One can also pre-superscript or post-superscript figuratives with an asterisk * when wishing to emphasize the figurative type. These three notational forms are equivalent.

$^{fl\text{-}}$**OPERATIVE**, or ***OPERATIVE***, *or* $^{fl\text{-}}$**figurative**, or ***figurative*** := fluent scheme. We use a prefixed $^{fl\text{-}}$ or, more commonly, use italics to represent temporally structured schemes (operative or figurative), which we call *fluents*. Fluents embody temporal change and produce *expectancies*—figurative or operative anticipatory expectations. Expectancies (fluent schemes) function as figuratives or operatives depending on the context.

#OPERATIVE, **#figurative**, **#*OPERATIVE***, **#*figurative*** := parameter. Parameters are schemes that indicate conditions under which the operative scheme to their left should

be applied on its figurative(s) to achieve intended results. Fluents (temporally structured schemes) and other relational schemes can function as parameters. We symbolize parameters with a number sign (#) placed before the scheme.

^{E}**OPERATIVE** := Executive scheme. Anterior E-superscript indicates that the operative in question stands for an executive.

***figurative[…]** or **OPERATIVE[…]** := The content inside square brackets specifies semantic aspects of the scheme to which the brackets attach (i.e., schemes inside the brackets are related to, or part of, the scheme characteristics). We represent *adjunct information* relative to a figurative or operative by affixing to the scheme this information enclosed in square brackets. For instance, in the state of affairs described by the sentence, "Boy who dogs chase feeds cat," the relative clause (i.e., "who dogs chase") is adjunct information referring to the boy, which we can represent as *boy[CHASE(*dogs, *boy)].

$figurative or **$OPERATIVE** := The scheme is true, i.e., concretely real (examples: $dog, $cookie-grasped). This meaning of $ applies to any sort of scheme. It indicates that the scheme, here-and-now, is *perceptually and cognitively true* and concrete in its scheme application.

λfigurative or **λOPERATIVE** := The lambda prefix indicates that the figuratives or operatives are *language schemes*, expressed by words or phrases. They may or not have a concretely real meaning referent (then they could also be marked by prefix $).

figurative[K: …] or OPERATIVE[K: …] := The symbol **K** here stands for knowledge and indicates that the schemes that follow (i.e., …) are activated in the mind, represented in consciousness as mentation, but are not applied to any actual situation or action. They are mental without perceptual or motor applications of schemes. For example: Sally[K: choco : Loc1] or Sally[NOT.K: choco : Loc2]. In English, these translate as: "Sally knows that chocolate is in Location1," or "Sally does not know that chocolate is in Location2."

X.Y := X is semantically related with Y in the current context (schemes of any sort).

X :: Y := The scheme X precedes and (in the present process) leads to scheme Y (i.e., X and Y are an ordered pair with a causal link).

X : Y : Z… := Schemes X, Y, Z temporally follow one another and may be coordinated. They can also be used to mark distinct dimensions of variation or aspects, with various parameter values, within a functional totality (i.e., a coordinated set of schemes in a hierarchical or complex application). Names of the dimensions/aspects are often omitted. For instance in: "PLACE(Anne : chocolate : Loc2)." This means "PLACE(*Who*Anne: *What*chocolate: *Where*Loc2)."

X:.Y := X controls Y. Thus when X is a figurative scheme, it relates semantically to Y; when X is an OPERATIVE, it applies on and controls Y.

X ← Y := Scheme Y leads to the local emergence of scheme X, or Y brings attention to X within the task process, perhaps because X is precondition of Y (or is otherwise related to it).

X… → Y := The thin arrow (→) indicates results of the locally preceding (X…) operation. With a similar meaning we can also use (:>). For instance, X…:> Y.

OP(#fig1, OP2(fig2), …) := The comma (,) separates schemes (parameters, operatives, or figuratives) that, within the scope of a given operative OP, are distinct and locally independent.

XX ➔ Y := The formula of schemes XX produces, by the principle of Schemes' Overdetermination of Performance (*SOP*), the response or outcome Y.

M [OP (#scheme-1, *scheme-2, *scheme-3, …)] ➔ scheme-n := Any underlined scheme within a formula (here *M*[…]) is being boosted in its activation by the *M*-operator, which applies on the schemes *enclosed by square brackets*. Thus operative scheme OP, parameter #, and figurative schemes *… have boosting activation by *M*. In most of these formulas, *M*-operator and its square brackets (*M* […]) are omitted for simplicity; but operatives, figuratives, and parameter(s) boosted by *M* are underlined to indicate *M*-boosting.

M [OP (#scheme-1, *scheme-2, *scheme-3, …)] ➔ **$RESPONSE** := The correct, true overt RESPONSE (i.e., the task-appropriate overt response) is symbolized with a prefix $ to mean *in truth a correct overt Response* (or perhaps a correct external referent). When the overt Response in question (or external referent) is inappropriate/*false* (i.e., there is mismatch between scheme's expectancies and real effect or referent) we would instead prefix the *false* negative sign ^. For instance, ^RESPONSE.

{.... *M* [OP (#scheme-1, *scheme-2, *scheme-3, …)] ➔ scheme-n } := Braces {…} without a posterior subscript stand for the *field of activation*—that is, all activated schemes in the person's total repertoire (activated long-term memory). Here suspension points stand for activated schemes that are omitted. This representation of a task is useful when one wants to present several strategies that are either collaborating or competing to control performance. In this case, outside the M-centration (or *M*-space), that is, outside *M*[…] but within { YY…*M*[…]}, one would present other schemes YY that stand for alternative strategies. We can signal whether strategies are competing with the main strategy because they are false (prefixing *false* sign, e.g., ^YY), or are compatible with it (prefixing a *true* sign, e.g., $XX).

OPERATIVE^{L1} := An *L-superscripted* scheme (whether operative, figurative, or expectancy/fluent) is *L-structured* (overlearned, chunked) with another scheme that has subscripted the same *L1* or *L2,* and so on. In this case, the first (*L-superscripted*) scheme is boosting the activation of the second (*L-subscripted*) scheme. This boosting allows the second to be highly activated without using power of mental attention (*M*-boosting). Thus *L*-operator (not the *M*-operator) would be boosting the scheme. Presence of a question mark (*L*?) next to the second scheme (subscripted *L*?) indicates that this *L*-boosting is uncertain and may not exist.

{....}$_{L1,\ F}$:= Braces with subscript indicate that enclosed scheme(s) is(are) not being boosted by *M*, but boosted instead by operators posteriorly subscripted to the braces—in the example *L1* and *F*. When braces would contain only one scheme, they can be omitted and superscripts attached to the scheme, i.e., scheme$_{L1,\ F}$.

{....}$_{Sit,\ F}$:= Subscripts *Sit* and *F* indicate that schemes inside the braces are not boosted by *M* but by local factors in the current situation (*Sit*) such as sensorial/perceptual salience or automatized perception. *Sit,* as local cause or boosting factor, would include sensorial-field factors (F_s) but exclude *intellective* cognitive-field and mental factors represented as *F, M, LM, E,* and so on.

Figurative*!**, **Figurative!**, or ***Operative*!** := An exclamation point (!) postfixed to a scheme, perhaps a fluent, indicates that the expectancy attached to this scheme has been violated. For example, the hand with a toy goes behind screen **b** and then reappears without the toy: {*toy-in-hand-TO-**b}^{L1,Sit} ← {no-toy-at-hand-after-**b!**}$_{L1,Sit}$. In this example, two schemes (demarcated by braces {…}) are activated in an empirically reverse sequence (←), which exhibits violation of the initial scheme's expectancy. We symbolize this

expectancy-violation by ! because subjects should experience surprise when toy-in-hand went to b but toy does not reappear behind b as expected.

X … <::> Y … := Strategies X … and Y … are in dialectical/contradictory relation and may be in conflict or compete, that is, be misleading to each other.

<: x: y: z :> := **x, y, z** constitute a dynamic dialectical system with three components, each dialectically coordinated (: :) with the other two.

^{**figurative**[…]$_I$ }$_{sit}$ or ^{**OPERATIVE**(…)$_I$ }$_{sit}$:= The negative sign ^ prefixed to schemes inside braces {…}, which have situational boosting factors (*sit*) subscripted to the second brace (i.e., ^{…}sit), means the schemes are not task relevant and are perhaps misleading, although strongly activated by *sit* or by hidden operators. These schemes should be attentionally interrupted (inhibited—our *I*-operator) to solve the task. We have indicated so by subscripting *I* after the second bracket. In this manner, one could highlight misleading characteristics of any situation appearing in a formula. A parameter (#) may also be needed, boosted by *M,* to remind the subject to do this inhibition (subscripted *I*).

Scheme-2? := Scheme-2 may or may not need to be boosted by *M*-capacity (the underline suggests *M*-boosting). This uncertainty is signaled by the question mark. The estimate of *M*-demand should then be a range of values that include or exclude it from *M*-marked schemes. Thus, in this example: *M* [OP (#scheme-1, *scheme-2?, *scheme-3, …)], the *M*-demand would be either 4 or 3, both being plausible.

[[…]] := The content of these double square brackets is an analyst's commentary, description, or statement. Although relevant to the task analysis, it is not part of it (i.e., it does not belong to, but is outside, the metasubjective model description).

Formulas for Mental Strategies

To represent pragmatic relations found among strategies in a given task (e.g., a conflict/misleading situation among schemes that constitute contradictory strategies within the same misleading situation), we place the strategies' name inside brackets (e.g., [(fa) YY], meaning "formula number a, of strategy YY"). We then connect the strategies by a logical connective to indicate the sort of interrelation. For example, V is a logical incompatibility symbol signifying that the strategies activated are in conflict; & is a

conjunction indicating compatible co-activation; V is a disjunction indicating compatibility but often separate activation; <::> is a dialectical relation between strategies, and so forth.

Example: ^*F,LC* [(fa) YY] <u>V</u> $*E,M,I* [(fb) XX]

To the left-side bracket of each strategy we name the hidden operators (organismic resources) that boost activation to schemes of their strategy (in this example, the field factor *F* and the automatized-learning operator or structures *LC* boost strategy YY). To the left of the hidden operators we place a symbol to indicate whether the strategy in question is valid/true for the task (symbolized by $) or is invalid/false (symbolized by ^). The full generic formula in the example is the key analytical expression of a *misleading situation*. All misleading situations satisfy this generic formula (Pascual-Leone, 1989), which is also found in infancy: a false (^) strategy boosted by *F* and *LC* opposed to a true ($) strategy boosted by *E*, *M*, and *I*.

This sort of formula expresses different sorts of relation among strategies. For instance, in *facilitating situations*, where various activated strategies can apply together complementarily to produce the intended (valid, true = $) performance, the logical connective chosen to relate them would be an inclusive disjunction (V). In the example below, both YY and XX could contribute to a correct performance, although XX is more analytical, attentionally effortful, and perhaps more sophisticated. Often the less sophisticated strategies serve two functions in facilitating situations: they can speed up performance via overdetermination, and they can add a personal or psycho-cultural style to actions or representations occurring in the task, an individual-expression possibility that dynamic-analytical psychologies and artists often utilize.

Example: $*C,LC,A* [(fa) YY] V $*E,M,LM* [(fb)XX]