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ABSTRACT

Reported are studies attempting to describe the sorts of skills that toddlers need if they are to successfully complete intentional, or volitional, actions. A variety of tasks designed for children 15 to 35 months of age were administered; additional data were gathered that were relevant to the child's awareness of producing an outcome and emotional reactions to producing outcomes. Tasks were engaging; were within the manual capacity and understanding of the youngest child in the sample; and required some monitoring and control for successful completion. Specific task outcomes were explained or modeled. Each task involved conditions requiring control, such as waiting, selecting materials, or avoiding distractions. In this paper, specific tasks and results are described. General questions concerning relationships between understanding what to do, volitional skills, the self, and action are discussed. Findings suggest that much of the impetus for increasing volitional skills comes from the child's own interest in and attention to the mastering of action problems. Equally as important as external sources of control were challenges inherent in everyday, volitional actions. In general, children acquire the abilities to be the masters of their own actions through increases in their ability to monitor increasingly coherent units of action and to correct activities in midstream. (RH)

VOLITIONAL SKILLS IN TODDLERS

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Volitional Skills in Toddlers

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I suppose that most of you would agree with me that increasing control over one's actions counts among the more notable of developmental achievements. What we might not agree on, though, is how such control arises and how best to study its development. Much, indeed most, of the developmental research on early self control and regulation has looked at control in a particular set of circumstances, which could be loosely described as compliance situations. Whether the focus of research is on how children respond to parental demands, such as not performing a forbidden act, or suppressing a disapproved behavior, or on how they negotiate experimental "rules" such as waiting for a signal to act, or delaying gratification, the pressure for control is external to the actor, and is not an intrinsic part of the particular task or actions the child engages in. Although compliance certainly looms large in the list of developmental milestones, such a focus on control based on the wishes of others may not fully capture the range of situations in which control must be exercised, and it emphasizes parental input as the primary causal force for explaining how control and regulation develop over time.

Today I would like to tell you about some work in which control is considered in a slightly different way, as part of the general category of intentional or volitional actions. In this research, Paul Lütkenhaus and I have attempted to describe the sorts of skills that are necessary for the successful completion of intentional, or volitional actions in the toddler years. We chose to study toddlers because around 18 months to 2 years, children start to show what appear to be conscious attempts at self control. It seemed to us that we could get an idea of what it is that develops as control increases by looking at how children begin to master the sequence, timing and accuracy of

their own actions.

So, our first task was to be a little more precise about what we meant by intentional behavior and control. For us, any activity that is done in order to attain some anticipated outcome or end state is volitional behavior. We have conceptualized volitional actions as requiring some general skills, and some control skills specific to acting, as illustrated in the first figure.

Insert Figure 1 about here

On the general side are cognitive skills. To act intentionally implies that the actor can represent and anticipate a not-yet-attained goal, can understand the means-end relationship between activities and a desired outcome, and can remember the outcome while acting. These are the minimal abilities necessary for acting beyond the immediate push and pull of the stimulus environment. In some cases, the actor may also represent a criterion of successful performance, or standard, that can be used to compare current activities with an anticipated outcome.

On the specific side are volitional skills. These are skills necessary for successfully carrying out intentional actions. They include attention control, inhibition control, and monitoring. By attention control we mean the skills that allow one to remain "on task," to avoid distractions, and direct attention. By inhibition control, we mean an ability to interrupt an activity, to stop acting when an outcome is reached, and to wait for appropriate opportunities to act. By monitoring we mean an executive function that allows one to segment an action into units, to oversee their content and sequence, to compare what one is doing with an anticipated goal, and to overcome obstacles or make corrections when necessary.

It seemed to us that the child's increasing proficiency in acting was due not just to general cognitive changes, but also to changes in the kinds and

extent of volitional skills available. We also asked ourselves why there seemed to be a transition point in control at around 2 years of age, and wondered if concurrent changes in the extent to which the child perceives itself as an active agent, as a self, might provide some of the impetus for assuming greater control. Certainly, the emotional issues of the toddler years--compliance, tantrums to confinement, the "no" phase, and a need to perform actions without help -- seem on the surface to be quite relevant to action control problems. We thus speculated that increases in the extent to which children explicitly represent the self as an agent of action and changes in emotional involvement with actions might accompany increased action control.

With these ideas in mind, we designed a variety of tasks for children aged 15 to 35 months. We chose tasks that meet several criteria: they must be within the manual capacity and understanding of the youngest children in our age range; they must be engaging, so that children are interested in performing them; and finally, they must require some amount of monitoring and control for successful attainment. For each task, we explained or modelled a specific outcome (or standard), and to make some amount of control necessary, we constructed the various tasks so that waiting or selecting of materials or avoiding distractions was a necessary feature. We also gathered measures relevant to the self -- in particular, the child's awareness that he or she had produced an outcome, and emotional reactions to producing outcomes.

First I will tell you about some of our specific tasks and results to give you a flavor of what we have done, and then I will turn to the more general questions of the relationship between understanding what to do, volitional skills, the self and action.

In one exploratory study, our central goal was to describe how producing task-directed outcomes changed over the toddler years, and to ask whether there was any meaningful relationship between action control and the self. We used performance on three different tasks to provide a general assessment of

attention to task standards, of control, and of monitoring and corrections during the course of acting. We compared these general action control measures with self-related responses.

The three action tasks were each simple, block building or clean-up tasks. The first task, which we called the tower task, consisted of several trials in which children were to build 3-block towers to match a 3-part figure. For each trial, the E labelled each block, here feet, arms, head, and then assembled them into a tower. She then said to the child, "You build that too," and laid the blocks on the table with extra, unpainted blocks. The correct outcome was to build the figure in the correct order. Control was necessary in monitoring the order and alignment of the blocks during building the tower, and in building just with the painted blocks.

The goal of the Figure dressing task was to fill the body of a wooden figure with four blocks, painted red, green, blue and yellow. The correct outcome was to match the block colors to the same colors painted inside the box. Control was necessary, because children were given more blocks than needed to fill the figure.

The last task was deceptively simple -- the correct outcome was to clean chalk marks off a blackboard. The chalk was on just 1/3 of the board, and the child was given a sponge and water. Control problems were more inherent to the activity on this task -- playing with the sponge and water were powerful distractors.

Our analyses concerned children's attention to task standards, their control in terms of stopping, more specific control measures of monitoring and self-corrections, and the relation of these measures to self-related responses. I will describe each of these in turn.

For attention to task standards, we used two measures. One, which we called outcome orientation, concerned whether the child matched a rudimentary standard in producing the sort of outcome requested. The second measure

concerned whether the child produced the precise, correct outcome. The percentage of children whose actions fell into these two categories are shown in Figure 2, averaged across the three tasks.

Insert Figure 2 about here

Generally, task standards were not incorporated into the youngest children's actions. Although children in the youngest group did perform the activities appropriate to the requested outcomes, that is, they washed and they stacked blocks, their activity was not generally outcome oriented. By 20 mos there was more of a focus on producing outcomes -- on average, over half the children did so, and almost all children did so on at least on task. However, the outcomes produced tended more to be those afforded by the materials, not the standards inherent in the task instructions -- that is, these children built towers, filled containers, and washed the blackboard, but they did not seem to attempt match any specific standard. After 2 years, in contrast, outcome orientation was pretty much at ceiling. Producing correct outcomes, that is, matching an external standard, was consistent only in the 32 month group, although most children in the 26 mo group were correct on at least one task. From these tasks, we would set two years as the point at which a focus on producing outcomes, rather than simply acting for its own sake is consolidated. Such a focus is a necessary precondition to the active use of control.

Although children <u>begin</u> to pay attention to standards at the end of the second year, successfully incorporating these standards into behavior comes a little later. We find it important to distinguish between passive recognition of a standard, which perhaps reflects task understanding or knowing what to do, and the ability to incorporate that standard into behavior, reflected in task performance. We saw evidence for the difference between recognition and active use of a standard in the tower building task -- many children who produced

incorrect outcomes knew it -- they commented, for example, that the figure pieces were out of order. In a subsequent study we followed up on this observation more systematically, and found that 70% of 24 no olds who built incorrect towers nonetheless could discriminate correctly and incorrectly built figures. So knowing what to do did not at all guarantee successful performance.

Another piece of evidence that it is not simply task understanding that limits children's performance comes from the overall results on control, shown in Figure 5 as stopping. Stopping means using only the painted blocks in the block tasks, or ending swiping at the blackboard after the chalk marks are erased. Overall, stopping lagged somewhat behind attention to a rudimentary outcome standard. In addition, stopping was not guaranteed by correct outcomes -- of the children who produced correct outcomes, that is who cleaned all the chalk marks or who filled the clown with the correct colors, or who built figures in the correct order, about 25% still failed to stop.

In addition to stopping, action control requires an ability to monitor activities with respect to an anticipated outcome. To capture this aspect, we looked more closely at monitoring and self-corrections on the tower building task. We coded three measures. One concerned whether the child monitored how single blocks were aligned -- a piece by piece monitoring. The second concerned whether the child monitored whether the entire tower was aligned, that is built the unit carefully. The third concerned whether the child made corrections while building. The corrections could be to change the order of the blocks, their orientation, or to take out one of the unpainted blocks.

Insert Figure 3 about here

Figure 3 shows the percentage of children in each age group who showed monitoring or corrections. As one can see, the monitoring of children in the younger groups tended to be restricted to the manipulation of single blocks.

In contrast, virtually all the children in the two older age groups monitored how the entire tower was built. Corrections, which we considered to reflect monitoring with respect to an outcome standard, were infrequent overall, and restricted primarily to the two older age groups. The frequency and type of monitoring suggest to us that at first monitoring begins to be exercised with respect to how an activity is performed, and then, as standards become more explicitly defined, in terms of what is produced. It is as though the unit of action changes from one of separate, isolated activities to one in which the activities are subjugated to an anticipated outcome.

Additional support for the importance of monitoring comes from another study (Lütkenhaus & Heckhausen, 1986, unpublished manuscript) in which children's task was to wait in the middle of an action for an object needed to complete the action. Those children who successfully waited, generally children older than 2 yrs, tended to show what might be called "waiting" monitoring -- they verbalized what they were waiting for, or held the other task objects in front of the box holding the object they were waiting for. These actions, perhaps very rudimentary strategies to keep the goal of the task in mind, or to fill the waiting period, served to increase performance success.

It seemed to us from these preliminary studies, that it would be fruitful to look at monitoring and control for asking what it is that children need to acquire for successful attainment of action goals. In our ongoing work, we are investigating these areas more directly. We are using a number of tasks in which we have made the requirements for monitoring explicit, and in which children's attempts to monitor their activities are visible for observation.

One task is the following: children pour water into a large, plastic funnel. The activity, pouring water, is intrinsically interesting to children. However, pouring the water is simply a means to another end -- by pouring water, children can move Peter, a doll figure, up an "elevator" in a large, adjacent wooden doll house. Peter's mother and dog wait for him on a platform about half

way to the top of the house. When Peter arrives home, the dog, which is a mechanical dog, yaps and wags its tail, something the children find fascinating to watch. However, when too much water is poured in, the figure goes too far in the elevator and disappears, and the dog remains quiet. In order to make monitoring an issue, the apparatus is set up so that the child cannot pour water and watch the progress of the figure simultaneously. What we have observed in pilot work is that children younger than 2 1/2 years generally monitor their actions at the beginning -- that is, they pour and turn to watch, but as the activity proceeds, they seem to momentarily forget the goal, become lost in pouring, and of course pour in all the water, making the figure disappear. In contrast, the older children break the act of pouring into smaller units -- they pour, stop, look, then pour again. It seems as though two things occur: what can be manipulated and separated into controlled pieces differs, and the extent to which the task goal takes precedence over the task activity increases with age.

A second task for looking at monitoring is a block building task in which children must monitor what color block they pick up with what hand. We pin a red pin on one sleeve, and a yellow one on the other. Then, we play a game in which the children learn that they can pick up red blocks only with the red hand, and yellow blocks only with the yellow hand. After training on this difference, and after the child has correctly used the appropriate hands when given one or another block, we place all the blocks on the table and ask the child to build a high tower. Here, we can see the struggles to maintain monitoring as the activity proceeds. The older children look at their hands, then pick up a block, whereas the younger children are more likely to notice a color mismatch after they have picked up a block, and less likely to correct the mismatch, even if noticed.

Thus far I have only discussed the changes in children's action control and competence. A second, general question behind this work was to look at the

relation between action control and involvement of the self. We investigated this relation by collecting several self measures, one of which I will describe in detail. We looked at involvement in producing outcomes, especially reactions one could loosely describe as pride or happiness when an outcome is produced. Emotional responses, including facial and postural gestures, were coded from the Tower task described earlier. What we found was that the tendency for emotional responses increased with age: from 36% of the 17 mo group to 90% of the 32 mo group. These responses were specific to producing outcomes: Very few children showed emotional responses to the experimenter's building, and very few children showed emotional responses during building.

However, more interesting to the question of the involvement of the self in actions, we found that outcome reactions tended to be associated with higher performance on an individual level. We looked at just those children who showed outcome reactions at all, and asked when they showed these reactions across the 5 Tower building trials. What we found was that emotional reactions tended to occur when a child produced his or her better towers - suggesting that the emotional involvement is specific to better outcomes, and perhaps greater effort.

So we can describe the changes in actions and control as the following: children younger than a year and a half primarily focus attention on the flow of their actions, rather than on the ends or consequences that their activities lead to. By 20 months, children are more likely to pay attention to producing outcomes per se, however the outcomes produced are still unspecific and produced without much control or monitoring. With the beginning of the third year there is a change: most children have begun to consistently regulate their activities with respect to producing outcomes, that is they pay attention to standards, and show control and monitoring with respect to these standards, suggesting that for them, actions are more clearly represented as a unit, defined in terms of some anticipated outcome. However, the skills to manipulate the separate pieces

of this unit, that is to direct and correct activities in midstream are infrequent until after 30 months. We suspect that the improved performance of children 2-1/2 and older arises from two sources -- their understanding of the precise standards to be produced is more articulated, providing a different criterion for an outcome than for the younger children, and second, they are more able to correct and manipulate the sequence and components of their actions. An increased ability in this age range to correct one's errors, not simply to avoid them, has been noted by others, such as Judy DeLoache as well. The ability to insert new or different actions into an ongoing sequence or to correct an outcome after it has been completed are examples of volitional skills that require two things: an integration of separate activities under the guidance of specific task standards, and a flexible representation of the action, allowing manipuation of the components.

The age and trial effects for outcome reactions suggest to us that there may be a change in the underlying motivational basis of actions during the second and third years. Positive emotional responses to producing outcomes increase in frequency before children are consistently correct, suggesting that one impetus for practicing action skills is the pleasure found simply in producing outcomes. In addition, at all ages pleasure was most likely when the child produced an outcome that required attention, effort, or that posed an action "problem." An affective reaction specific to autonomous attempts to achieve a goal may be an indication of the first active relations between the experience of mastery and the self, and this experience may be one of the ingredients necessary for the development of an explicit sense of agency and competence.

Although our present data allow only speculation, it seems that much of the impetus for increasing volitional skills comes from the child's own interest and attention in mastering action problems. Changes in volitional control during our tasks seemed to arise from the child's own (and spontaneous) use of

distractors, or from the child's noticing and then slowly correcting an incorrect product. This is not to say that external sources of control are unimportant, but that an equally important, but often overlooked reason for exercising control lies in challenges inherent in everyday, volitional actions. Through increases in the ability to monitor increasingly coherent units of action, and to correct activities in midstream children acquire the abilities to be the masters of their own actions.

FIG. 1

ACTION COMPETENCE

- GENERAL COGNITIVE SKILLS:
  - representation
  - memory
  - knowledge
- VOLITIONAL SKILLS:
  - attentional control
  - monitoring
  - inhibition control

FIG. 2

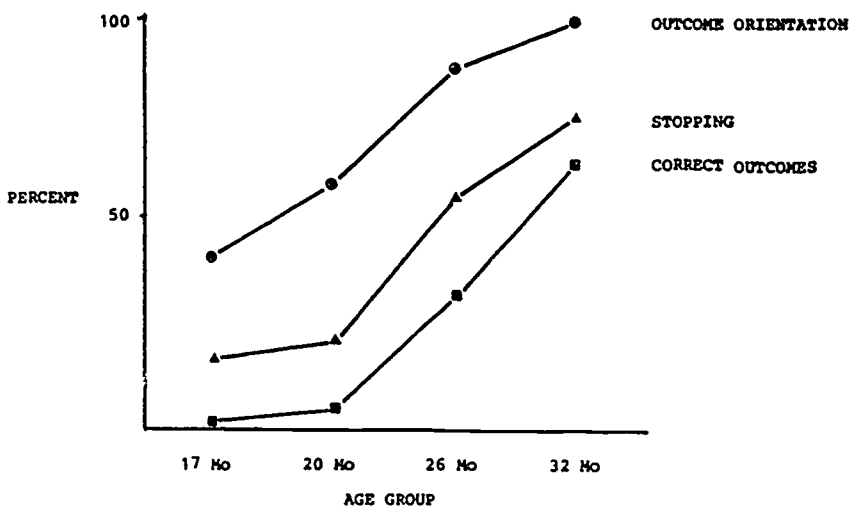

FIG. 3