

Dynamic Performance Analysis (DPA):

AN ALTERNATE APPROACH TO ACTIVITY ANALYSIS

The purpose of this paper is to describe the Dynamic Performance Analysis approach to activity analysis, contrast it with typical activity analysis and describe the context for its use.

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M eet Emily, a seven year old girl with cerebral palsy who wants to become independent in dressing. She is starting with the basics – putting on a sock – she is struggling. Her coordination is such that she cannot easily grasp the sock nor can she easily put it over her toes or pull it up. But she is determined – with great effort, she gets the sock over a few toes and begins to pull. She pulls and pulls and pulls, to no avail! Now what?

For the therapist working with Emily there are two options: – she can do a traditional activity analysis and determine that Emily’s motor skills, coordination and strength are inadequate to meet the demands of the task. Putting on a sock requires fine motor grasp, body stabilization, bilateral coordination, and strength. Armed with that information the therapist recommends that Emily has further therapy to work on improving strength, balance and fine motor coordination and that she has assistance with this and the other ADL tasks that require the same motor skills. Alternatively, she can do a dynamic performance analysis (DPA) and determine that Emily has the sock over four of her five toes, that the sock is caught on her little toe and that all the pulling in the world will not get that sock on. Armed with that information, the therapist draws Emily’s attention to the toe, Emily clears the toe, pulls on the sock again and the sock goes on. With a few more practices, Emily becomes independent in her first ADL dressing task. How does the therapist decide which approach to choose?

A BRIEF HISTORY OF ACTIVITY ANALYSIS

Activity analysis is a staple of occupational therapy, a crucial part of the occupational therapy assessment and treatment process (Allen, 1987); but it

did not originate in occupational therapy, nor is it unique to occupational therapy.

The origin of activity analysis is based in the industrial world in the early 1900s, in its interest in the systematic study of job performance. It was created by engineers to evaluate workers' movements (e.g., motion, speed) and task components (e.g., light, tools) aiming to increase the productivity of factories and industries (Creighton, 1992). It remains an important tool today as is evident from this modern definition of activity analysis found in an online business dictionary:

Activity analysis is: «Identification and description of activities in an organization, and evaluation of their impact on its operations. Activity analysis determines (1) what activities are executed, (2) how many people perform the activities, (3) how much time they spend on them, (4) how much and which resources are consumed, (5) what operational data best reflects the performance of activities, and (6) of what value the activities are to the organization. This analysis is accomplished through direct observation, interviews, questionnaires, and review of the work records.» (<http://www.businessdictionary.com/definition/activity-analysis.html>)

Activity analysis has been an important aspect of occupational therapy almost since the inception of the profession. Focused on using activity to cure, early occupational therapists needed to understand the therapeutic value of activity, to quote (Howland, 1944):

«Occupational therapy is based on the principle that since voluntary activity is a normal function of every organ and structure, then, when injury or disease has resulted in an impaired activity, amelioration or recovery may be greatly assisted, on the one hand by physical exercise of the disabled member (read: body structure), while, on the other hand, the patient's mind is kept preoccupied with some diversional occupation such as art, music, crafts or recreation» (pp. 32-33).

Accordingly, occupational therapists were early adopters of activity analysis and it became an important component of the occupational therapy programs and training courses designed for the re-employment of soldiers returning from World War I (Creighton, 1992).

In those early years, psychiatric occupational

therapists were concerned with the characteristics of activities that would address patients' emotional and social needs, so the activities were analysed and rated in terms of the types of tools and materials used, level of complexity, appeal to different ages and sexes and modifiability. Therapists working with those with physical disabilities were concerned with the physical characteristics of activities; and guidelines for analyzing crafts in terms of such performance aspects as joint motion, muscle strength, and bilateral coordination were developed (Creighton, 1992). Occupational therapy curricula devoted considerable time to teaching students activity analysis skills both from a physical and social-emotional perspective. Having students become familiar with the characteristics of a broad range of activities was central to occupational therapy education programs, and students spent hours in labs performing and analyzing a broad range of activities.

Over time, different types of activity analyses were proposed based on a variety of theoretical frameworks (Fisher, 1998), each focusing on unique characteristics of activities, for example, the cognitive, sensory or perceptual requirements, the postures and movement patterns involved, the associated volitional and habitual components and the environmental factors (Creighton, 1992).

Today activity analysis can take a variety of forms, depending on the theoretical framework. However, in all cases it «addresses the typical demands of an activity, the range of skills involved in its performance, and the various cultural meanings that might be ascribed to it» (p. 239, Schell, Gillen, Scaffa and Cohn, 2013).

The activity analysis process is generally an armchair process, that is, a theoretical one that can be carried out in the absence of the individual. The intention being to determine both the generic properties and inherent characteristics of the activity as it is normally performed, and its remedial potential and modifiability (Creighton, 1992). Armed with the knowledge of activity characteristics, the therapist can examine the goodness of fit between activity and individual and can determine if a given activity can be used therapeutically to address the needs of the individual or can be adapted to match the capacity of the individual. In Emily's case it is a process that resulted in the therapist recommending that Emily has further therapy to work on improving strength, balance and fine motor coordination and that she has assistance with this and the other ADL



Emily is a seven year old girl with cerebral palsy who wants to become independent in dressing. She is starting with the basics - putting on a sock. Foto Colourbox

tasks that require the same motor skills.

In contrast the DPA process is an active, observational performance-based process, that cannot be performed in the absence of the individual. DPA necessitates an understanding of how a particular person performs a particular activity in a particular context, the intention being to enable successful performance. In Emily's case it is a process that resulted in the therapist drawing Emily's attention to the toe that was preventing her from pulling on her sock, in Emily correcting her performance, achieving success and with further practice becoming independent in her first ADL dressing task.

DYNAMIC PERFORMANCE ANALYSIS

Dynamic Performance Analysis (DPA) is an observation-based process designed to identify performance problems or breakdown. It was developed in tandem with the development of the Cognitive Orientation to daily Occupational Performance (CO-OP) approach as a therapist tool (Polatajko & Mandich, 2004). In CO-OP, a client-centred, performance-based, problem-solving approach to occupa-

tional enablement, the therapist uses DPA iteratively to identify the performance breakdown(s) and possible strategies to solve the performance problem. The CO-OP therapist guides the client in the use of a problem solving strategy, goal-plan-do-check, to identify their own solutions to their particular performance problems. Studies of DPA within CO-OP have indicated that as CO-OP progresses the clients, be they children or adults, also begin to carry out DPAs iteratively to support their own performance improvement (Hyland & Polatajko, 2012; Schneiderman, Kinslihk, McEwen, and Polatajko, 2008, respectively).

While designed to complement the CO-OP approach, DAP is embedded in a top-down framework and thus has applicability in any approach that is based on the premise that performance is the product of the interaction of person, environment, and occupation, and thus focused on the specific way that a specific client performs a specific activity (Polatajko, Mandich, and Martini, 2000).

Although predicated on activity analysis, the DPA process does not depend on a generic analysis of activity characteristics nor a predetermined strategy for performance. Rather, DPA is based on the assumption that there is no single sequence of steps for an optimal performance. The purpose of DPA is to solve performance problems that affect the execution of the desired activity. In this way, the smallest part of the activity analysis is not a body component required to perform a task (e.g., fine motor grasp, body stabilization, bilateral coordination, or strength), but a sub-performance unit of the actual activity (locating the sock, or bringing it to the foot, or putting it over toes, or pulling it up, depending on the performance breakdown).

HOW TO CARRY OUT A DYNAMIC PERFORMANCE ANALYSIS

Dynamic Performance Analysis, depicted in the DPA decision tree (see Polatajko et al 2000), is comprised of a series of questions designed to be used in an iterative manner to identify the specific performance breakdown(s) experienced by an individual during the performance of a specific action. The series of questions are organized into two parts: performer prerequisites and performance requisites.

The performer prerequisite questions address the motivation and basic task knowledge of the performer. As DPA is based on actual performance it is important to first ascertain if the individual is actually

motivated to perform the activity and has the necessary basic knowledge to do so. If there is no motivation to perform the activity, the DPA ends. (The client-therapist interaction then shifts to re-examining the clients' occupational goals or motivating the client.) Assuming motivation is present the next step is to determine if there is a basic understanding of how the activity is performed. If there is no basic understanding of performance, the DPA must also end. (The client-therapist interaction then shifts to establishing a basic understanding of the activity performance.) If this second prerequisite is met, an examination of the performance can begin.

The performance requisite questions determine the initial level of competence for the activity as a whole and then each performance sub-unit; in each case ascertaining, through direct observation of performance, or reported performance, competence and performance breakdown. The series of questions are:

1. Is the performance competent?
2. Where in the performance is there a breakdown?
3. Regarding each point of breakdown,
 - a. Does the client know what to do?
 - b. Does the client want to do it?
 - c. Can the client do it?
 - i. Does he/she have the capacity?
 - ii. Are the occupational demands/supports appropriate?
 - iii. Are the environmental demands/supports appropriate?

The evidence from CO-OP research is that for the most part, the breakdown occurs because the client does not know what to do. Accordingly, the interventions strategies used most frequently are task specification (Rodger & Polatajko, 2005; Schneiderman et al, 2008). By way of example, recall Emily's problem with pulling up her sock. Once Emily's attention was drawn to the observation that her sock was caught on her little toe, she could solve the problem and successfully put on her sock.

As the DPA is a continuous and interactive process, it can be used during evaluation and throughout intervention. Evidence from CO-OP studies suggest that clients spontaneously carry out their own DPA, but that these are generally too generic to improve performance – e.g., when Emily kept pulling at her sock to no avail, she was actually carrying out a DPA and concluding that the sock needed to come up further. Unfortunately, her DPA

was not specific enough DAP to note the role of the little toe in preventing the sock from coming up. When her attention was drawn to this aspect of the performance, she could independently solve the problem and experience success. Evidence from CO-OP studies further suggests that this type of intervention can influence the generation of specific DPAs. Hyland and Polatajko (2012) evaluated the use of DPA by children with developmental coordination disorder (DCD). The authors analyzed the data from 13 previously recorded videos of three different types of interventions and concluded that when, as happened in Emily's case, the clients are actively involved in the DPA process, i.e., are guided to notice performance issues and propose solutions, as occurs in the CO-OP approach, the clients begin to carry out his/her own specific DPAs, spontaneously. On the other hand, when the therapist simply uses the DPA to inform herself on how to direct the clients' performance, as occurs in direct skill training approaches, the client does not learn to carry out specific DPAs.

Complementing the decision tree, there is a clinical recording tool for DPA called the Dynamic Performance Analysis Record (DPAR) (Polatajko & Mandich, 2004). The DPAR captures the essential features of the clinical reasoning process outlined in the DPA decision tree and provides a permanent record of the analysis and the specification of the intervention strategies. The DPAR has a rating scale that can be used before and after intervention to quantify performance and document change. The DPAR tool is grouped into four sections:

- performer prerequisites,
- performance requisites,
- identification of performance breakdown and
- specification of intervention strategies.

The first three sections of the DPAR are very similar to the dynamic performance analysis decision tree, with the addition of a 10-point rating scale that allows the quantification of the observations. The section related to specification of intervention strategies was created to complement the decision tree by guiding the consideration of target intervention strategies. The main purpose of section IV is the specification of intervention strategies that address and account for the client's abilities, the occupational and environmental demands and the necessity of performance's changes and possibilities of intervention.

EVIDENCE REGARDING DPA

With the exception of the Hyland and Polatajko (2012) study discussed above, there has been no direct studies of the DPA process. However, DPA is a key feature of CO-OP, indeed CO-OP cannot be performed without the simultaneous performance of iterative DPAs. Accordingly, studies of CO-OP provide indirect support for its usefulness as a clinical tool. To date there are 27 studies in the literature reporting on studies examining the effects of CO-OP with a variety of populations, addressing a broad range of activities. In all cases the evidence is positive (Scammels, Bates, Houldin, & Polatajko, H. J. (accepted 2015), indicating that DPA was used successfully to support skill performance.

CONCLUSION

DPA is a useful alternative to traditional activity analysis. It is an observation-based process designed to identify performance problems or breakdown and support the identification of solutions. DPA is focused on the unique way that each client performs a task and serves to focus intervention on improving that performance rather than focusing on performance components. Based on the current top-down thinking and centred on actual performance DPA is an important tool for occupation-based practice.

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