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The Performance Diagnostic Checklist and Its Variants: A Systematic Review

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ABSTRACT

The Performance Diagnostic Checklist (PDC) is an indirect assessment tool used to identify the variables supporting problematic employee performance. The tool includes four domains; based on PDC results, an assessment-based intervention targeting one or more of these domains is evaluated. In recent years, PDC variants such as the PDC-Human Services (PDC-HS), the PDC-Safety, and the PDC-Parent have been developed. The purpose of this study is to review the research that has employed the PDC and its variants. We found twenty-eight published studies which have used the PDC or one of its variants. The PDC-HS has been most commonly used, followed by the PDC, the PDC-Safety, and PDC-Parent. The PDC and its variants have most often been completed with supervisors of employees exhibiting performance concerns. Many studies have identified multiple PDC domains as problematic, although domains representing antecedents and consequences are most commonly indicated. Interventions have typically been developed based on the highest scoring domain. Few studies have collected data on social validity or maintenance of intervention effects. Overall, results support the utility of the PDC and its variants, but also highlight PDC-related topics in need of additional research

KEYWORDS

Assessment; indirect assessment; performance diagnostic checklist; performance analysis; organizational behavior management

Organizational behavior management (OBM), which some consider to be a branch of or closely related to applied behavior analysis (ABA), refers to the application of behavioral principles within organizational settings (Wilder et al., 2009). The overarching goal of OBM is to identify, predict and control variables within organizational environments that influence employee behavior to improve individual and organizational results (Gravina et al., 2021). OBM has been applied in a variety of industries and settings, including for-profit industries such as manufacturing and retail, nonprofit organizations such as clinics and schools, and government facilities. OBM has been used to improve individual and group performance, safety, and processes and systems in organizations. Assessment in OBM, the focus of this study, is used to identify the variables contributing to a performance, safety, or systems problem and involves identification of the variables related to the performance of concern.

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Unlike many disciplines, assessment results in OBM and ABA are directly relevant to intervention development. That is, because the purpose of assessment in behavior analysis is to identify environmental variables contributing to a performance concern, intervention strategies are directly informed by assessment outcomes. Thus, assessment is of great importance in OBM and ABA; researchers have spent considerable time and effort developing and evaluating various assessment techniques (Gravina et al., 2021).

Often referred to as performance analysis (PA; Wilder et al., 2018), assessment in OBM, particularly at the individual performer level, is designed to determine if the performance concern is a "can't do" problem or a "won't do" problem. That is, performance concerns typically fall into one of two categories: those that involve an employee skill deficit ("can't do concerns") and those that involve a motivational deficit ("won't do concerns"). The solution (intervention) to these problems is often some form of training or task clarification to address a skill deficit and the use of effort manipulation, goal setting, and feedback to address a motivational deficit.

Although the precise source of reinforcement (e.g., social positive reinforcement, social negative reinforcement) for a performance concern is not identified in PA (it often is in ABA), the training, prompts, rules, materials, and contingencies (or lack of these things) supporting the problem is a focus of the assessment process. PA grew out of functional assessment in ABA, which focuses on identifying the contingencies supporting a specific behavioral excess. Once identified, interventions designed to directly address those contingencies are developed (Horner, 1994). Three methods of functional assessment in ABA exist: indirect, descriptive, and experimental (Kelley et al., 2011). Indirect or informant assessments include the use of interviews, rating scales, and questionnaires. In indirect assessment, information about the target behavior is derived from reports of caregivers or others close to the individual who exhibits the behavioral excess. Indirect assessment is efficient, but because information regarding possible maintaining variables comes from other's reports, it may be less accurate than other methods (Iwata et al., 1990).

Descriptive or naturalistic methods of assessment involve direct observation of the targeted behavior in the natural environment to identify the variables supporting or maintaining the behavior. Observations focus on collecting data on antecedents that precede and consequences that follow the target behavior (Bijou et al., 1968). Examples of descriptive methods include narrative ABC recording, structured ABC recording, and scatterplots. Although generally more accurate than indirect methods, descriptive methods of assessment are time consuming (Iwata et al., 1990). In addition, descriptive methods may more accurately predict the absence of a function as opposed to the presence of a function (Contreras et al., 2023).

Experimental assessment, also referred to as functional analysis, involves the systematic manipulation of contingencies in order to determine the

function of the targeted behavior (Iwata et al., 1982/1994). Two types of experimental analysis exist: the AB method and the ABC method. The AB method involves systematically manipulating the antecedent to the target behavior (E. G. Carr & Durand, 1985). The ABC method involves systematically manipulating both the antecedents and consequences to the target behavior (Iwata et al., 1982/1994). The AB method is well-suited for some settings in which it is difficult to manipulate consequences, but it may not be as accurate as the ABC method (Potoczak et al., 2007). The ABC method is the gold standard by which all other forms of functional assessment are judged, but may be difficult to implement in some settings and may be less socially valid than other methods (Sharp et al., 2021).

Assessment in OBM can be divided into 5 types: historical assessment, indirect assessment, descriptive assessment, experimental assessment, and systems assessment (Wilder et al., 2018). Historical assessment involves examination of data collected in the past. In many cases, these data were previously collected by the organization itself. This type of assessment, also called a record review, is particularly common in behavioral safety, a sub-discipline of OBM. As an example, Hermann et al. (2010) examined the type and frequency of injuries at a Mexican auto parts plant and then implemented an intervention which targeted the safety deficits identified by the assessment.

As in ABA, indirect assessment in OBM involves gathering information about the performance problem via interviews and questionnaires without directly observing the performance or the environment. Descriptive assessment methods involve directly observing the performance as it occurs in the workplace. Experimental assessment or analysis involves systematically manipulating variables to determine their effects on the target performance. Experimental analysis is difficult to conduct in OBM, as it may interfere with ongoing business operations. In addition, it is often difficult to isolate and manipulate specific variables in organizational settings.

Systems analysis involves examining behaviors or performances that are part of a larger context or system. As an example, process mapping involves identifying a problematic process in an organization (e.g., billing) and creating both an "is" map of the way in which the process is being conducted, and a "should" map of the way in which the process should be conducted. The goal is to identify disconnects in the process so that it can run more smoothly and efficiently.

Despite the variety of assessment techniques that exist in OBM, the use of behavioral assessments is less common in OBM practice and research than in ABA. In fact, Wilder et al. (2018) conducted a review of all issues of the *Journal of Organizational Behavior Management* (JOBM) to identify how many studies had employed the use of pre-intervention assessment tools. Their results revealed that only 28% of studies published between the years 2000 and 2015 had incorporated the use of a pre-intervention assessment tool. Austin et al.

(1999) suggested the lack of assessments used in OBM may be partly due to many interventions yielding favorable outcomes without the use of a pre-intervention assessment. Additionally, because OBM interventions are typically tailored to increasing a behavior or performance, many practitioners and recipients of OBM interventions may not be familiar with the rationale behind the use of assessments. A third reason Austin et al. give for the lack of use of assessment in OBM is that much of the work in OBM relies on rules, which are ephemeral and difficult to assess (Austin et al., 1999).

Of existing OBM assessment methods, indirect or informant assessments are the most common types used in OBM research. Wilder et al. (2018) found that 24% of empirical studies published in *JOBM* used an indirect assessment. Indirect assessments include the PIC/NIC Analysis® which was developed as a tool to identify the positive, immediate, and certain consequences (PIC) that increase the future probability of a behavior or performance, and to identify the negative, immediate (future), and certain (uncertain) consequences (NIC) that decrease the future probability of a behavior or performance (Daniels & Bailey, 2014). Another example of an indirect assessment in OBM includes Binder's Six Boxes, which evaluates performance problems based on expectations and feedback, tools and resources, consequences and incentives, skills and knowledge, selection and assignment, and motives and preferences (Binder, 2009).

The performance diagnostic checklist

A third indirect assessment tool used in OBM is the Performance Diagnostic Checklist (PDC). Developed by Austin (2000), and based on assessment models by Gilbert (1978) and Mager and Pipe (1997), the PDC is most often completed with supervisors or managers to examine the variables contributing to problematic employee performance. The PDC is divided into four domains: (1) *antecedents and information*, (2) *equipment and processes*, (3) *knowledge and skills*, and (4) *consequences*. The information yielded from the PDC is then utilized to design and implement interventions to improve performance. The PDC is sometimes supplemented with direct observation to further validate the results of the questionnaire (Austin, 2000). With or without direct observation, the PDC has quickly become one of the most commonly used assessments in OBM (Gravina et al., 2021).

The PDC includes 20 questions (4–6 questions in each of the four domains). Although the original version did not include an intervention planning section, a recent revised version of the tool does (Gravina et al., 2021). The intervention planning section prompts users to rank the questions indicating a performance concern by their severity. Users are then encouraged to address the indicated questions/domains by selecting an intervention from a list of sample interventions. Citations for each sample intervention are provided so

that users can read the ways in which the procedure has been implemented in journal articles.

The questions in the *antecedents and information* domain assess the extent to which the instructions for the performer are clear. The questions in the *equipment and processes* domain assess the extent to which the immediate environment and organizational processes support the performance. The questions in the *knowledge and skills* domain assess the extent to which the performer has been properly trained and has the skills necessary to do the job. The *consequences* domain assesses the extent to which the consequences are sufficient to motivate the performer (Gravina et al., 2021). The PDC is scored by calculating the number of items in each domain (a "no" answer is indicative of a concern) and then rank ordering the domains that are most problematic. An intervention is generally selected in one of two ways: 1) based on the highest scoring domain (i.e., the domain with the most concerns) or 2) based on each domain with a minimum score (often 50% or more of questions indicating a concern). Interventions based on the latter method are often multi-component.

As an example of how the tool might be used, consider a consultant who is charged with improving the performance of a number of employees (i.e., a department or division) in a manufacturing organization. As a first step, the consultant might conduct a number of formal and informal assessments to learn about the organization and the specific department. At some point, the consultant will begin measuring individual and departmental performance (if it is not already being measured). Once adequate measures of performance are obtained, the consultant might use the PDC to identify the possible variables supporting poor performance (e.g., although training has occurred, the specific tasks need and the order in which they are to be done has not been clarified and employees are not given feedback on their performance). Once these variables are identified, the consultant develops an intervention (e.g., task clarification and feedback), proposes it to the management team, and if approved, implements it. If performance improves, the consultant trains one or more employees to monitor, implement, and sustain the intervention.

Since the establishment of the PDC, some derivatives or variants have also been developed. First, J. E. Carr et al. (2013) adapted the PDC for use in human service settings. The Performance Diagnostic Checklist- Human Services (PDC-HS), includes the domains of (1) *training*, (2*) task clarification and prompting*, (3) *resources, materials, and processes*, and (4) *performance consequences, effort, and competition*. The PDC-HS, unlike the original PDC, includes some direct observation components to further validate assessment results. Another PDC variant, the PDC-Safety, was developed by Martinez-Onstott et al. (2016) to identify the variables contributing to performance issues affecting employee safety. The PDC-Safety includes the same domains as the original PDC but the questions within each domain have been modified

to address specific variables maintaining inadequate or unsafe practices in the workplace. A third variant, the PDC-Parent, was developed by Hodges et al. (2020) and includes the same domains as the PDC-HS, with questions adapted to reduce technical jargon and better address concerns with parenting performance.

The PDC and its variants have become the assessment tools of choice in the OBM literature, thus, it is important to periodically review their use and effectiveness. As an example, Wilder et al. (2020) recently reviewed the PDC-HS. These researchers described the existing literature base, and suggested avenues for future research, including the way in which interventions are selected based on PDC-HS outcomes. However, this review only included 7 studies. Many additional studies on the PDC and its derivatives exist. Thus, although a recent review described the early PDC-HS literature, no comprehensive review of the PDC and its variants exists. Thus, the purpose of this study was to conduct a systematic literature review of PDC and PDC variant studies. More specifically, the purpose was to identify the most common PDC variant, the most commonly indicated PDC/variant domains, the most common intervention selection method among PDC and variant studies, and the commonality of social validity and maintenance data in PDC and variant studies.

Method

We used the PRISMA guidelines for conducting systematic literature reviews (Liberati et al., 2009). These guidelines include systematic identification of articles on a given topic, screening these articles to be certain they do indeed focus on the topic of interest, and manually checking each article to be sure it meets the inclusion criteria. We used the search term "Performance Diagnostic Checklist" to identify articles, so any article using the PDC or one of its variants was included, even if it involved an analysis of the psychometric properties of the tool and not an evaluation of the tool to assess and improve performance. We searched for this term in the PsycInfo™ and ERIC™ databases. This yielded 1,056 results. We then reviewed the titles and abstracts of these articles and eliminated those that were irrelevant, which yielded 24 articles. Finally, we reviewed the reference sections of each manuscript, and reviewed the "early view" articles in the *Journal of Organizational Behavior Management, Journal of Applied Behavior Analysis, and Behavior Analysis in Practice*. This yielded an additional four articles, most of which were published online in "early view" journal sections. Thus, we identified 28 empirical articles which have used the PDC or one of its variants to date. Next, we reviewed each of the 28 articles in detail to verify that they focused on the Performance Diagnostic Checklist and met our inclusion criteria, which was "empirical articles in

which the PDC or one of its variants was used." A second coder independently conducted the search and screening process described above; results were identical to the primary coder.

We then read and coded each article according to which PDC variant was used, which problematic domains were identified from the PDC, with whom the PDC was completed, which interventions were selected and how they were determined, whether validation of the PDC was conducted (i.e., whether the researchers compared a PDC-indicated intervention to a non-indicated intervention), and whether measures of social validity and maintenance were collected. The category for PDC variant included four possible codes: PDC, PDC-HS, PDC-Safety, and PDC-Parent. The category for problematic domain was coded based on PDC variant. For the PDC and PDC-Safety, four codes were possible: antecedents and information, equipment and processes, knowledge and skills, and consequences. For the PDC-HS and PDC-Parent, four codes were possible: training, task clarification and prompting, resources, materials, and processes, and finally, performance consequences, effort, and competition. For the category of the person with whom the PDC or its variant was completed, four codes were possible: employee supervisor, peer employee, employee, and parent (only for PDC-Parent). For the category of intervention selection rationale, two codes were possible: highest scoring domain and threshold score. "Highest scoring domain" refers to the selection of an intervention based on the single highest scoring domain in the PDC or a variant. "Threshold" refers to the selection of an intervention based on each PDC or variant domain that achieves a minimum or threshold score. For the category of intervention selected, we simply described all interventions employed (e.g., training, feedback, etc.). For the categories of PDC validation, social validity and maintenance data collected, two codes were possible: yes and no. For social validity, we coded a "yes" if the study included any measure (however informal) of the social validity of the PDC variant or the assessment-based intervention. For maintenance, we coded a "yes" if the study included any maintenance data for an assessment-based intervention. For some studies, one or more of these categories and codes were not applicable (e.g., Cymbal et al., 2020; Wilder et al., 2020) because the focus of the study was not on using or evaluating the PDC to develop an intervention. Finally, some studies did not specify the information needed to complete one or more categories. When this was the case, we coded"not specified."

A second coder collected data on intercoder agreement for 50% of articles for each of the categories described above. An agreement was defined as both coders coding the same code for a given category. A disagreement was defined as one coder coding something other than the original coder for a given category. To calculate agreement, we divided agreements by agreements plus disagreements, multiplied the outcome by 100, and converted the result to a percentage. Intercoder agreement was 100% for all categories in each article.

Results

Table 1 provides an overview of the 28 studies and the outcomes for each of the categories that we coded. The most common settings where studies utilizing the PDC or a variant were conducted were a clinic or in-patient facility (9 or 32%), a retail store (5 or 18%), a school (5 or 18%), a university (3 or 11%), a restaurant (2 or 7%), and finally, one each was conducted in a library, a private home, on a sports field, or remotely (online). The most common variant used in the experimental research reviewed within this literature review was the PDC-HS with fifteen studies, followed by the original PDC with nine. Only three studies used the PDC-Safety and only one used the PDC-Parent. In most studies, the PDC or variant was administered to an employee within the same organization as the targeted participant, and who was responsible for overseeing the targeted performance of the participant with respect to the study dependent variables. Specifically, 13 studies (46%) interviewed supervisors to complete the PDC or a variant. Peer employees (instead of supervisors), participated in the PDC interview process in one of the studies. Both employees and supervisors were interviewed in two studies. In the remainder of the studies reviewed, individuals completing the PDC were not specified or this category was not applicable.

In many studies (13 of 25; 52%), multiple domains within the PDC were identified as contributing to poor performance (denominator was 25 because 3 studies were not applicable). These also varied depending on which PDC variant was used; for example, the PDC-HS includes domains which are different from those of the original PDC. Thus, a direct comparison of domains across the PDC variants should be interpreted with caution. Figure 1 depicts the number of times each domain has been indicated within each PDC variant across the 28 studies. For studies indicating multiple domains, we counted each domain indicated. Since some studies included more than one PDC or variant administration and more than one domain was indicated in a number of studies, the total number of times all domains were indicated in this figure is more than 28. Across all variants, the antecedents and consequences domains (again, specific titles of these domains vary) were most commonly indicated.

In most studies (22 of 25; 88%), the highest scoring domain within the PDC was selected to identify the subsequent intervention (again, denominator was 25 instead of 28). To further assess the validity of the PDC as an assessment tool, 6 of the 25 applicable studies (24%) implemented non-indicated interventions, or interventions selected from domains with low scores derived from the PDC. These studies, while less common, typically yielded results validating the PDC by producing substantially improved performance when indicated interventions were utilized in comparison to non-indicated interventions. It should be noted that none of the studies reviewed compared the effectiveness

Table 1. PDC and its variants empirical articles published through 2022.

Article	Setting	PDC Variant	Variant Results	Specific Results	Variant Completed With	Int Selection Rationale	Intervention Selected	Non-Ind Int	Social Validity	Maintenance
Amigo et al. (2008)	Restaurant	PDC	Multiple Domains	Antecedents and Information; consequences	Not Specified	Highest Scoring Domain	Task clarification, feedback, goal setting	No	No	Yes
Bowe and Sellers (2018)	School	PDC HS	Training	N/A	Employee Supervisor	Highest Scoring Domain	BST	Yes	Yes	No
J. E. Carr et al. (2013)	Clinic or In-Patient Facility	PDC HS	Multiple Domains	Training; PCEC	Employee Supervisor	Highest Scoring Domain	Training, task clarification, feedback	Yes	No	No
Collier-Meek et al. (2021)	School	PDC HS	Multiple Domains	Training; PCEC	Not Specified	Highest Scoring Domain	BST, job aides, increased supervisor presence	No	Yes	No
Cruz et al. (2019)	Clinic or In-Patient Facility	PDC Safety	Antecedents and Information	N/A	Employee Supervisor	Highest Scoring Domain	Prompting, job aides, feedback	Yes	No	No
Cymbal et al. (2020)	University	PDC HS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DePaolo et al. (2018)	Sports Field	PDC	Multiple Domains	Antecedents and Information; Consequences	Employee Supervisor	Highest Scoring Domain	Prompting, consequences	No	Yes	No
Ditzian et al. (2015)	Clinic or In-Patient Facility	PDC HS	PCEC	N/A	Employee Supervisor	Highest Scoring Domain	Feedback (verbal and graphical) and written prompts (non-indicated tx)	Yes	No	No
Doll et al. (2007)	Retail Store	PDC	N/A	N/A	Employee Supervisor	Other	Task clarification, prompting, feedback	No	No	No
Eikenhout & Austin (2005)	Retail Store	PDC	Consequences	N/A	Employee Supervisor	Highest Scoring Domain	Goal setting, feedback, delivery of social reinforcement	No	Yes	No
Gravina et al. (2008)	Clinic or In-Patient Facility	PDC	Multiple Domains	Antecedent and Information, Equipment and Processes; Consequences	Both Employee and Supervisor	Highest Scoring Domain	Task clarification, feedback, environmental manipulations	No	No	Yes
Guercio & Hunyadi (2022)	Clinic or In-Patient Facility	PDC HS	Multiple Domains	Task clarification and prompting; PCEC	Employee Supervisor	Highest Scoring Domain	Prompting	No	No	No

(*Continued*)

Table 1. (Continued).

Article	Setting	PDC Variant	Variant Results	Specific Results	Variant Completed With	Int Selection Rationale	Intervention Selected	Non-Ind Int	Social Validity	Maintenance
Hays and Romani (2020)	Clinic or In-Patient Facility	PDC HS	PCEC	N/A	Employee Supervisor	Highest Scoring Domain	Task clarification, feedback, goal setting	No	No	Yes
Hess et al. (2022)	Library	PDC HS	Multiple Domains	Training; Task clarification, prompting	Other	Highest Scoring Domain	BST, verbal and visual prompting	No	Yes	Yes
Hodges et al. (2020)	Clinic or In-Patient Facility	PDC Parent	Task Clarification and Prompting	N/A	Parent	Highest Scoring Domain	Task clarification, prompting, extra materials (non indicated)	Yes	Yes	Yes
Martinez-Onstott et al. (2016)	University	PDC Safety	Consequences	N/A	Employee Supervisor	Highest Scoring Domain	Feedback	No	No	No
Melendez et al. (2020)	Private Homes	PDC HS	Training; PCEC	N/A	Not Specified	Highest Scoring Domain	BST	No	Yes	Yes
Merritt et al. (2019)	School	PDC HS	Multiple Domains	Task clarification and prompting; Resources materials and processes; PCEC	Both Employee and Supervisor	Highest Scoring Domain	Task clarification, prompting, feedback, incentives	No	Yes	Yes
Miller et al. (2014)	School	PDC	Multiple Domains	Antecedents and information; Equipment and processes; Consequences	Employee(s)	Other	Feedback, goal setting, incentives	No	No	No
Pampino et al. (2003)	Retail Store	PDC	Multiple Domains	Antecedents and Information; Consequences	Employee Supervisor	Highest Scoring Domain	Task clarification, feedback, incentives	No	Yes	No
Pampino et al. (2003)	Retail Store	PDC	Multiple Domains	Antecedents and Information; Consequences	Other	Highest Scoring Domain	Task clarification, goal setting, rewards, feedback	No	No	No
Pugliese et al. (2021)	School	PDC Safety	Consequences	N/A	Not Specified	Highest Scoring Domain	Feedback, incentives, increased materials accessibility	No	Yes	No

(*Continued*)

Table 1. (Continued).

Article	Setting	PDC Variant	Variant Results	Specific Results	Variant Completed With	Int Selection Rationale	Intervention Selected	Non-Ind Int	Social Validity	Maintenance
Rodriguez et al. (2005)	Restaurant	PDC	Multiple Domains	Antecedents and information; Equipment and processes; Consequences	Both Employee(s) and Supervisor(s)	Highest Scoring Domain	Task clarification, self-monitoring, equipment modification, goal setting, feedback	No	Yes	No
Russell et al. (2020)	Clinic or In-Patient Facility	PDC HS	PCEC	N/A	Not Specified	Highest Scoring Domain	Job aides, feedback	No	No	No
Smith and Wilder (2018)	Retail Store	PDC HS	Training	N/A	Employee Supervisor	Not Specified	Inform, model, feedback	No	No	No
Vance et al. (2022)	Remote (Online)	PDC HS	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A
Wilder et al. (2018)	Clinic or In-Patient Facility	PDC HS	Multiple Domains	Training; Task Clarification and Prompting; Resources, Materials, and Processes; PCEC	Employee Supervisor	Highest Scoring Domain	Feedback, increased materials availability, task clarification, BST	Yes	No	No
Wilder et al. (2019)	University	PDC HS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Int Sel Rationale = Intervention Selection Rational; Non-Ind Int = Non-Indicated Intervention; PCEC = Performance Consequences, Effort, and Competition; BST = Behavioral Skills Training; N/A = Not Applicable; Tx = Treatment.

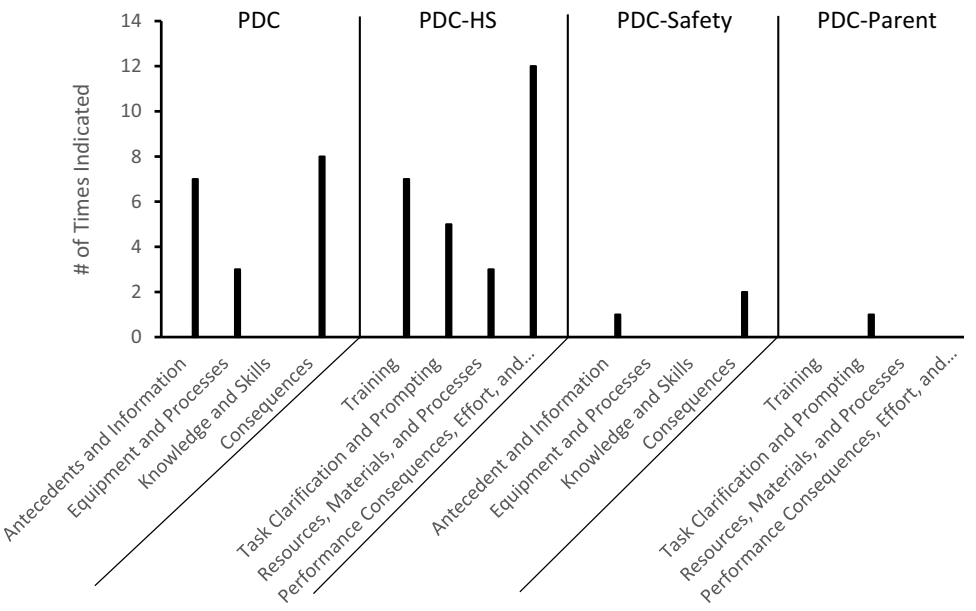

Figure 1. Number of times each domain has been indicated in studies through 2022 across PDC and its variants.

of interventions selected from the PDC with other assessment tools that were indirect in nature.

Twelve of the 25 applicable studies (48%) reported social validity data, with most studies yielding favorable results such as participants agreeing with the intervention(s) selected and relevant key stakeholders being satisfied with the results achieved. Finally, while maintenance data were infrequently reported (7 of 25 studies; 28%); the studies that did report maintenance suggested the long-term benefits of the intervention with performance improvements remaining high in comparison to baseline, or with results extending to novel employees who received the intervention directly from their organization without the support of a research team.

Discussion

We systematically reviewed the literature on the PDC and its variants through 2022. We found 28 empirical studies that have employed the tool, published in 7 journals (*Journal of Organizational Behavior Management, Journal of Applied Behavior Analysis, Behavior Analysis in Practice, Journal of School Psychology, European Journal of Behavior Analysis, International Journal of Developmental Disabilities, and Behavioral Development*). The PDC-HS has been used most often, followed by the PDC, the PDC-Safety, and the PDC-Parent. Supervisors of employees exhibiting problematic performance are most often interviewed using the PDC and its variants. Multiple domains

were often identified as problematic in PDC and variant studies, with the antecedents and consequences domains most frequently indicated. Interventions were typically based on the PDC domain with the highest scores, although a threshold approach to scoring and intervention development has recently been suggested (Vance et al., 2022). Social validity and maintenance data on interventions derived from PDC results were rarely reported, but when these data were reported, the outcome was generally favorable.

Overall, the results produced in the studies evaluated in this review support the utility of the PDC and its variants. Of course, a publication bias may exist, which threatens this conclusion. That is, because studies that suggest the PDC and its variants may be useful are more likely to be accepted for publication than studies which do not show this, we cannot be entirely sure of the tool's utility. More research is needed to further support the validity of the PDC, including studies in which multiple, non-assessment based interventions are compared to an assessment-based intervention. In most previous research, one non-indicated intervention has been compared to an indicated intervention. However, the one non-indicated intervention is often selected arbitrarily, and powerful OBM interventions such as feedback are not often evaluated as the non-indicated intervention. Research demonstrating examples of ineffective PDC-based interventions, along with proposed or evaluated solutions to this problem, are needed.

As suggested by the results of this study, supervisors of the employee exhibiting the performance problem are most often interviewed using the PDC (although the parent was interviewed in the PDC-Parent study). This seems appropriate because the employee's supervisor is likely to have the most knowledge about the employee's performance. However, researchers in a few studies (Gravina et al., 2008; Miller et al., 2014; Rodriguez et al., 2005) completed the PDC with a peer employee or with the employee exhibiting the performance problem. This approach may have some advantages. For example, in some work environments, peer employees may know more about their fellow employee's performance than the employee's supervisor. Also, the employee exhibiting the performance problem may have unique insight into the variables contributing to their own problematic performance. Of course, this approach may also introduce bias into the process, as the employee may focus on one or more variables that only they think are relevant or may not even acknowledge the problematic performance. Nevertheless, future research comparing supervisor-completed versus employee-completed PDC outcomes is warranted.

In many studies, multiple domains within the PDC were identified as contributing to poor performance. This suggests that performance problems are often the result of multiple variables, including poor instructions/training, and weak or non-existent consequences (such as feedback) after performing. Still, in each PDC variant, two domains in particular, the antecedents and

consequences-related domains, were most frequently indicated. Nevertheless, the other two domains were sometimes indicated, which highlights the utility of the PDC and its variants for intervention selection. That is, selecting an intervention without an assessment might result in use of an irrelevant intervention. In most studies, the highest scoring domain within the PDC was selected to identify the subsequent intervention. The only other approach to intervention selection adopted by researchers is a threshold approach, suggested by Vance et al. (2022). However, since the Vance et al. study did not consist of an evaluation of the PDC or its variants, we did not code the study in this manner. Vance et al. was recently published; future PDC studies may be more likely to adopt a threshold approach to scoring.

In most studies, the highest scoring domain within the PDC was selected to identify the subsequent intervention. The domain with the highest scores represented the domain of most pressing concern identified by the PDC. This is not surprising, since the purpose of the PDC and its variants is to identify an assessment-based intervention. For example, if consequences were contributing to poor performance and had been identified as such through the PDC, an intervention would likely comprise some form of consequence based strategy (e.g., graphic or vocal feedback). Additional interventions frequently used in the reviewed studies included task clarification, behavioral skills training, goal setting, prompting, and the use of incentives.

One limitation of this study is that we did not review the methodological quality of the studies included in this review. It is likely that some of the studies in this review were methodologically stronger than others (e.g., some demonstrate good experimental control, while others may not). The outcomes of studies which are methodologically weak might not be weighted as heavily as studies which were sound; any conclusions about the utility of the PDC or its variants should consider the methodological features of this research.

In terms of practice, the results of this review suggest that professionals using the PDC or its variants have a number of examples of PDC outcomes and indicated interventions to draw on (with the exception of the PDC Parent). A variety of interventions have been employed; this review provides some broad information on the indicated interventions which have been most effective. Practitioners might also evaluate the two scoring methods (high-scoring and threshold) described in this review to determine which they prefer, given the context.

Research should also further examine the scoring of the PDC and its variants. As previously described, Vance et al. (2022) suggested a threshold approach to scoring, in which an intervention is selected based upon a minimum score in a given domain. If scores in multiple domains meet or surpass the threshold, then multiple interventions should be utilized. Although this approach seems logical, additional research is needed to support it. Further, multi-component interventions, which would be required in some

situations by the Vance et al. approach, are resource-intensive and often do not allow identification of the component most responsible for effects. Another concern with the threshold approach to scoring is that it is possible that no domain would meet the threshold, despite (in many cases) a clear need to address the performance problem.

Another possibility for improved scoring might be to use a threshold approach, but vary the minimum threshold required for an intervention across domains. The threshold for some domains might need to be lower than the threshold for others. For example, domains related to training might be particularly important, such that even low scores would indicate that an intervention to address a training deficit is warranted. Relatedly, some specific questions might indicate the necessity of an intervention, regardless of the overall domain score. More research on this and other aspects of PDC scoring is needed.

More PDC and PDC variant research is also needed across industries and populations. While several studies were conducted in retail and restaurant settings, the majority of studies were conducted within a healthcare or educational setting. This is likely because many OBM researchers work in these industries. However, it will be necessary to evaluate the use of the PDC across more industries, such as trade and manufacturing. Additionally, more research is needed with varied populations, including the increasing population of remote workers who are generally working with reduced supervision and more autonomy. Remote workers may present a particular challenge to the use of the PDC, because their supervisors may be less familiar with work contexts, distractions, and other variables that may impact their performance.

Another topic in need of additional research is frequency of re-assessment. That is, no studies have examined the appropriate frequency of re-assessing performance concerns using the PDC or its variants. Jobs, tasks, responsibilities, and supervisors change in organizations; these changes likely result in new variables affecting performance. Additional research is needed to determine how often the PDC and its variants should be conducted. Until the results of such studies are available, the best advice might be to re-assess when jobs, tasks, responsibilities, or supervisors change.

The PDC-Safety and PDC-Parent variants are particularly in need of additional research, given that very few studies have evaluated these tools. The PDC-Safety should be compared to other methods of identifying the variables that contribute to safety concerns, such as informal and structured interviews. The PDC-Parent needs additional evaluation to determine if it accurately identifies barriers to parent implementation of behavioral treatment programs for their children. In addition, researchers should examine the PDC-Parent to determine if it is useful to identify barriers to the implementation of interventions prescribed by other professionals, such as speech-language pathologists and physical therapists.

Future research should also look to identify the efficacy of the PDC and PDC variants when implementing larger-scale interventions, employing group designs to evaluate results. This research will lend further merit to the PDC as an assessment and intervention development tool that can be more widely applicable across work environments. The development of additional PDC variants may also be useful. It is possible that other PDC variants may be developed based on differences in industries, populations, and purposes. As an example, a modified PDC to identify barriers to improving sports performance might be particularly useful.

The efficacy of the PDC should also be compared against other indirect assessment tools such as the PIC/NIC®. Comparisons may also be made against direct, experimental assessment tools, or by evaluating the effectiveness of combining different assessment methods (e.g., indirect methods and systems assessment). Such research would provide better direction regarding which assessment tools would be most applicable based on the dependent variable of choice, the setting in which the intervention is implemented, the size of the employee pool, and the goals of the organization.

Finally, research should also examine the validity and reliability of the PDC and its variants. To date, two studies (Cymbal et al., 2020; Wilder et al., 2019) have examined the validity and reliability of the PDC-HS, but no such research on the PDC or other variants exist. The two validity and reliability studies on the PDC-HS were conducted using videos depicting consults; participants were required to watch the videos and score the PDC-HS. Since the variables contributing to the performance problem were known, one measure of validity was the extent to which the participants obtained accurate scores on the PDC-HS. The studies also measured inter-rater reliability and test-retest reliability. Similar validity and reliability studies should be conducted with the PDC, PDC-Safety, and PDC-Parent.

In conclusion, the PDC and its variants have become a useful informant-based method of identifying the variables responsible for performance concerns among employees. Our results suggest the PDC and its variants are most often completed with supervisors of employees, that domains representing antecedents and consequences are most often indicated, and that interventions based on indicated domains are often effective to improve performance. Overall, results support the utility of the PDC and its variants, but also highlight PDC-related topics in need of additional research.

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Data availability statement

Additional data to support the findings of this study are available from the authors upon request.

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Ethics/IRB statement

We (the authors) followed all relevant ethical guidelines.

References

Amigo, S., Smith, A., & Ludwig, T. (2008). Using task clarification, goal setting, and feedback to decrease table busing times in a franchise pizza restaurant. *Journal of Organizational Behavior Management*, *28*(3), 176–187. https://doi.org/10.1080/01608060802251106

Austin, J. (2000). Performance analysis and performance diagnostics. In J. Austin & J. E. Carr (Eds.), *Handbook of applied behavior analysis* (pp. 321–349). Context Press.

Austin, J., Carr, J. E., & Agnew, J. L. (1999). The need for assessment of maintaining variables in OBM. *Journal of Organizational Behavior Management*, *19*(2), 59–87. https://doi.org/10.1300/J075v19n02_05

Bijou, S. W., Peterson, R. F., & Ault, M. H. (1968). A method to integrate descriptive and experimental field studies at the level of data and empirical concepts. *Journal of Applied Behavior Analysis*, *1*(2), 175–191. https://doi.org/10.1901/jaba.1968.1-175

Binder, C. (2009). Measurement, evaluation, and research. In K. H. Silber, W. R. Foshay, R. Watkins, D. Leigh, J. L. Moseley, & J. C. Dessinger (Eds.), *Handbook of improving performance in the workplace* (Vols. 1-3). https://doi.org/10.1002/9780470592663.ch54 .

Bowe, M., & Sellers, T. P. (2018). Evaluating the performance diagnostic checklist-human services to assess incorrect error-correction procedures by preschool paraprofessionals. *Journal of Applied Behavior Analysis*, *51*(1), 166–176. https://doi.org/10.1002/jaba.428

Carr, E. G., & Durand, V. M. (1985). Reducing behavior problems through functional communication training. *Journal of Applied Behavior Analysis*, *18*(2), 111–126. https://doi.org/10.1901/jaba.1985.18-111

Carr, J. E., Wilder, D. A., Majdalany, L., Mathisen, D., & Strain, L. A. (2013). An assessment-based solution to a human-service employee performance problem: An initial evaluation of the performance diagnostic checklist - human services. *Behavior Analysis in Practice*, *6*(1), 16–32. https://doi.org/10.1007/BF03391789

Collier-Meek, M. A., Sanetti, L. M. H., Gould, K., & Pereira, B. A. (2021). Using the performance diagnostic checklist to evaluate and promote paraeducators' treatment fidelity. *Journal of School Psychology*, *86*, 1–14. https://doi.org/10.1016/j.jsp.2021.02.005

Contreras, B. P., Tate, S. A., Morris, S. L., & Kahng, S. (2023). A systematic review of the correspondence between descriptive assessment and functional analysis. *Journal of Applied Behavior Analysis*, *56*(1), 146–165. https://doi.org/10.1002/jaba.958

Cruz, N. J., Wilder, D. A., Phillabaum, C., Thomas, R., Cusick, M., & Gravina, N. (2019). Further evaluation of the Performance Diagnostic Checklist-Safety (PDC-Safety). *Journal of Organizational Behavior Management*, *39*(3–4), 266–279. https://doi.org/10.1080/01608061.2019.1666777

Cymbal, D., Wilder, D. A., Thomas, R., & Ertel, H. (2020). Further evaluation of the validity and reliability of the performance diagnostic checklist-human services. *Journal of Organizational Behavior Management*, *40*(3–4), 249–257. https://doi.org/10.1080/01608061.2020.1792027

Cymbal, D., Wilder, D., Thomas, R., & Ertel, H. (2020). Further evaluation of the validity and reliability of the Performance Diagnostic Checklist—Human Services. *Journal of Organizational Behavior Management*, *40*(3–4), 249–257.

Daniels, A. C., & Bailey, J. S. (2014). *Performance management: Changing behavior that drives organizational effectiveness*. Performance Management Publications.

DePaolo, J., Gravina, N. E., & Harvey, C. (2018). Using a behavioral intervention to improve performance of a women's college lacrosse team. *Behavior Analysis in Practice*, *12*(2), 407–411. https://doi.org/10.1007/s40617-018-0272-6

Ditzian, K., Wilder, D. A., King, A., & Tanz, J. (2015). An evaluation of the performance diagnostic checklist-human services to assess an employee performance problem in a center-based autism treatment facility. *Journal of Applied Behavior Analysis*, *48*(1), 199–203. https://doi.org/10.1002/jaba.171

Doll, J., Livesey, J., McHaffie, E., & Ludwig, T. D. (2007). Keeping an uphill edge: Managing cleaning behaviors at a ski shop. *Journal of Organizational Behavior Management*, *27*(3), 41–60. https://doi.org/10.1300/J075v27n03_04

Eikenhout, N., & Austin, J. (2005). Using Goals, Feedback, Reinforcement, and a Performance Matrix to Improve Customer Service in a Large Department Store. *Journal of Organizational Behavior Management*, *24*(3), 27–62. https://doi.org/10.1300/J075v24n03_02

Gilbert, T. F. (1978). Human competence—engineering worthy performance. *Nonprofit Management Leadership*, *17*(9), 19–27. https://doi.org/10.1002/pfi.4180170915

Gravina, N., Nastasi, J., & Austin, J. (2021). Assessment of employee performance. *Journal of Organizational Behavior Management*, *41*(2), 124–149. https://doi.org/10.1080/01608061.2020.1869136

Gravina, N., VanWagner, M., & Austin, J. (2008). Increasing physical therapy equipment preparation using task clarification, feedback and environmental manipulations. *Journal of Organizational Behavior Management*, *28*(2), 110–122. https://doi.org/10.1080/01608060802100931

Guercio, J., & Hunyadi, S. (2022). Using the Performance Diagnostic Checklist-Human Services (PDC-HS) to Enhance Data Collection Procedures in Residential Treatment Settings for Clients with Significant Behavioral Challenges. *Journal of Organizational Behavior Management*. https://doi.org/10.1080/01608061.2022.2159611

Hays, T., & Romani, P. W. (2020). Use of the performance diagnostic checklist-human services to assess hand hygiene compliance in a hospital. *Behavior Analysis in Practice*, *14*(1), 51–57. https://doi.org/10.1007/s40617-020-00461-8

Hermann, J. A., Ibarra, G. V., & Hopkins, B. L. (2010). A safety program that integrates behavior-based safety and traditional safety methods and its effects on injury rates of

manufacturing workers. *Journal of Organizational Behavior Management*, *30*(1), 6–25. https://doi.org/10.1080/01608060903472445

Hess, B. H., Walker, S. G., & Sellers, T. P. (2022). Evaluating the performance diagnostic checklist-human services to address performance issues of adults with intellectual disabilities. *European Journal of Behavior Analysis*, *23*(2), 1–15. https://doi.org/10.1080/15021149.2022.2134960

Hodges, A. C., Villacorta, J., Wilder, D. A., Ertel, H., & Luong, N. (2020). Assessment and improvement of parent training: An evaluation of the performance diagnostic checklist–parent. *Behavioral Development*, *25*(1), 1–16. https://doi.org/10.1037/bdb0000092

Horner, R. H. (1994). Functional assessment: Contributions and future directions. *Journal of Applied Behavior Analysis*, *27*(2), 401–404. https://doi.org/10.1901/jaba.1994.27-401

Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1982/1994). Toward a functional analysis of self-injury. *Analysis & Intervention in Developmental Disabilities*, *2*(1), 3–20. https://doi.org/10.1016/0270-4684(82)90003-9

Iwata, B. A., Vollmer, T. R., & Zarcone, J. R. (1990). The experimental (functional) analysis of behavior disorders: Methodology, applications, and limitations. In A. C. Repp & N. N. Singh (Eds.), *Perspectives on the use of nonaversive and aversive interventions for persons with developmental disabilities* (pp. 301–330). Sycamore Publishing Company.

Kelley, M. E., LaRue, R. H., Roane, H. S., & Gadaire, D. M. (2011). Indirect behavioral Assessments. In W. Fisher (Ed.), *Handbook of Applied Behavior Analysis* (pp. 182–190). The Guilford Press.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *PLoS Medicine*, *6*(7), e1000100. https://doi.org/10.1371/journal.pmed.1000100

Mager, R. F., & Pipe, P. (1997). *Analyzing performance problems, or you really oughta wanna* (3rd ed.). Lake Publishers.

Martinez-Onstott, B., Wilder, D. A., & Sigurdsson, S. O. (2016). Identifying the variables contributing to at-risk performance: Initial evaluation of the Performance Diagnostic Checklist–Safety (PDC-Safety). *Journal of Organizational Behavior Management*, *36*(1), 80–93. https://doi.org/10.1080/01608061.2016.1152209

Melendez, J. L., Tarbox, J., & Parhimoon, S. (2020). Utilizing the performance diagnostic checklist – human services to assess and improve employee performance on mand training: A replication. *Journal of Organizational Behavior Management*, *40*(3–4), 258–272. https://doi.org/10.1080/01608061.2020.1801551

Merritt, T. A., DiGennaro Reed, F. D., & Martinez, C. E. (2019). Using the performance diagnostic checklist-human services to identify an indicated intervention to decrease employee tardiness. *Journal of Applied Behavior Analysis*, *52*(4), 1034–1048. https://doi.org/10.1002/jaba.643

Miller, M. V., Carlson, J., & Sigurdsson, S. O. (2014). Improving treatment integrity in a human service setting using lottery-based incentives. *Journal of Organizational Behavior Management*, *34*(1), 29–38. https://doi.org/10.1080/01608061.2013.873381

Pampino, R. N., Jr., Heering, P. W., Wilder, D. A., Barton, C. G., & Burson, L. M. (2003). The use of the performance diagnostic checklist to guide intervention selection in an independently owned coffee shop. *Journal of Organizational Behavior Management*, *23*(2–3), 5–19. https://doi.org/10.1300/J075v23n02_02

Potoczak, K., Carr, J. E., & Michael, J. (2007). The effects of consequence manipulation during functional analysis of problem behavior maintained by negative reinforcement. *Journal of Applied Behavior Analysis*, *40*(4), 719–724. https://doi.org/10.1901/jaba.2007.719-724

Pugliese, S. N., Wine, B., Liesfeld, J. E., Morgan, C. A., Doan, T. M., Vanderburg, N. M., & Newcomb, E. T. (2021). An evaluation of feedback-based interventions on promoting use of personal protective equipment in a school. *Journal of Organizational Behavior Management*, *41*(4), 332–345. https://doi.org/10.1080/01608061.2021.1920543

Rodriguez, M., Wilder, D. A., Therrien, K., Wine, B., Miranti, R., Daratany, K., Salume, G., Baranovsky, G., & Rodriguez, M. (2005). Use of the performance diagnostic checklist to select an intervention designed to increase the offering of promotional stamps at two sites of a restaurant franchise. *Journal of Organizational Behavior Management*, *25*(3), 17–35. https://doi.org/10.1300/J075v25n03_02

Russell, S. M., Casey, M. B., & Gilbert, A. L. (2020). The use of the performance diagnostic checklist-human services in development of interventions to increase fidelity. *International Journal of Developmental Disabilities*, *66*(5), 381–389. https://doi.org/10.1080/20473869.2020.1815510.

Sharp, R. A., Lucock, Z. R., & Jones, R. S. P. (2021). Preliminary investigation of two functional assessment methods for people with dementia: Effectiveness and acceptability. *Behavioral Interventions*, *36*(1), 93–104. https://doi.org/10.1002/bin.1747

Smith, M., & Wilder, D. A. (2018). The use of the performance diagnostic checklist-human services to assess and improve the job performance of individuals with intellectual disabilities. *Behavior Analysis in Practice*, *11*(2), 148–153. https://doi.org/10.1007/s40617-018-0213-4

Vance, H., Saini, V., & Guertin, E. L. (2022). A preliminary investigation of procedural refinements to the performance diagnostic checklist - human services. *Journal of Organizational Behavior Management*, *42*(4), 282–308. https://doi.org/10.1080/01608061.2022.2043218

Wilder, D. A., Austin, J., & Casella, S. (2009). Applying behavior analysis in organizations: Organizational behavior management. *Psychological Services*, *6*(3), 202–211. https://doi.org/10.1037/a0015393

Wilder, D. A., Cymbal, D., & Villacorta, J. (2020). The performance diagnostic checklist – human services: A brief review. *Journal of Applied Behavior Analysis*, *53*(2), 1170–1176. https://doi.org/10.1002/jaba.676

Wilder, D. A., Lipschultz, J., & Gehrman, C. (2018). An evaluation of the Performance Diagnostic Checklist-Human Services (PDC-HS) across domains. *Behavior Analysis in Practice*, *11*(2), 129–138. https://doi.org/10.1007/s40617-018-0243-y

Wilder, D. A., Lipschultz, J., Gehrman, C., Ertel, H., & Hodges, A. (2019). A preliminary assessment of the validity and reliability of the performance diagnostic checklist-human services. *Journal of Organizational Behavior Management*, *39*(3–4), 1940212. https://doi.org/10.1080/01608061.2019.1666772