



Methodological delimitations of the Brazilian research on effects of training

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Keywords:

work training impact;
organizational learning;
training evaluation.

Abstract

Individuals and organizations develop strategies that facilitate or promote training in order to meet the demands imposed by technological progress and socio-political changes. However, there are methodological problems concerning the effects of such strategies which must be considered. Gaps persist on how to overcome those issues. To address this need, this study presents a review of Brazilian production in the training research area, focusing on the impact on work. Among 85 Brazilian articles, 24 research reports with this focus were identified, and were analyzed according to the standards used in international reviews. Results indicated several tendencies, such as a higher use of amplitude than of depth measures, and simultaneous data gathering of predictive and outcome variables. Some methodological issues were suggested for progress in this area, such as research studies with experimental designs and the multilevel approach.

Delimitações metodológicas de pesquisas brasileiras sobre os efeitos de treinamento

Palavras-chave:

impacto do treinamento no
trabalho;
aprendizagem organizacional;
avaliação de treinamento.

Resumo

Indivíduos e organizações desenvolvem estratégias que facilitam ou promovem o treinamento, visando atender as demandas impostas pelo progresso tecnológico e mudanças sociopolíticas. Contudo, há questões metodológicas relacionadas aos efeitos de tais estratégias que devem ser consideradas. Persistem lacunas em como superar essas questões. Para atender a essa necessidade, este artigo apresenta uma revisão da produção brasileira em estudos na área de treinamento, focando em impacto no trabalho. Entre 85 artigos brasileiros, 24 relatos de pesquisa com esse foco foram identificados, os quais foram analisados de acordo com os padrões usados na literatura internacional. Os resultados indicaram algumas tendências, como um maior uso de medida em amplitude do que em profundidade e obtenção simultânea de dados relativos às variáveis preditivas e critério. Para o avanço nessa área, algumas questões metodológicas foram sugeridas, como pesquisas com delineamentos experimentais e a abordagem multinível.

Delimitaciones metodológicas de investigaciones brasileñas sobre los efectos del entrenamiento

Palabras-clave:

impacto del entrenamiento en
el trabajo;
aprendizaje organizacional;
evaluación del entrenamiento.

Resumen

Individuos y organizaciones desarrollan estrategias que facilitan o promueven el entrenamiento, para satisfacer las demandas impuestas por los avances tecnológicos y cambios socio-políticos. Hay, sin embargo, cuestiones metodológicas relacionadas con los efectos de tales estrategias que se deben tener en cuenta. Persisten lagunas sobre cómo superar esas cuestiones. Con vistas a atender a esta necesidad, el presente estudio presenta una revisión de la producción brasileña en estudios en el área de entrenamiento, centrándose en los efectos del impacto en el trabajo. Fueron identificados 24 relatos de investigación con este enfoque, entre 85 artículos brasileños analizados, los cuales se estudiaron según criterios de revisión internacional. Los resultados indicaron algunas tendencias, tales como un mayor uso de medidas de amplitud que de profundidad y obtención simultánea de datos relativas a las variables predictivas y de criterio. Para el avance en esa área, algunas cuestiones metodológicas fueron sugeridas, tales como investigaciones con delineamientos experimentales y con enfoque multinivel.

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Why organizations are concerned with the learning processes of their employees? Currently, when technological progress and socio-political changes imposes new rhythms and demands, the survival of such organizations in the job market is related to the ability of innovate, adapt and create a competitive advantage. This scenario furthers the rise of learning as a factor of global competitiveness, in which training, development, and education actions (TD&E) compose a strategic tool for organizations (Kraiger & Kavanagh, 2015; Manuti, Pastore, Scardigno, Giancaspro, & Morciano, 2015; Merriam & Leahy, 2005). This is performed in order to contribute for the acquisition of knowledge and skills, as well as to develop the ability of continuous learning, which may lead to a direct impact at the workplace (Aguinis & Kraiger, 2009; Merriam & Leahy, 2005). Also, attention has been given to the analysis of this impact at organizational level within aspects related to production, effectiveness, and innovation (Manuti et al., 2015; Noe, Clark, & Klein, 2014), and at social level within aspects related to the formation of human capital (Aguinis & Kraiger, 2009).

Individuals and organizations develop learning strategies that favor or promote training. Learning may be a result of intentionally planned situations or can be produced by opportunities that were naturally created from social interactions and work events (Borges-Andrade, 2015). Workplace learning is formal when it results from the efforts made by organizations in the presentation of structured learning actions. Conversely, this process can be informal when learning occurs based on strategies implemented by individuals in order to adapt themselves and develop the qualifications needed in their job positions (Manuti et al., 2015). Formal and informal learning processes occur in a parallel manner at the workplace. However, there are evidences of differences in regard to predicting their effects (Abbad & Borges-Andrade, 2014). This study aims to present a review of the Brazilian scientific production on the effects of formal learning or training actions.

The organizational investments on such actions have justified a high number of research studies with mixed results that promote the optimization of processes and contribute to the progress of the area (Aguinis & Kraiger, 2009; Blume, Ford, Baldwin, & Huang, 2010; Grossman & Salas, 2011; Zerbini & Abbad, 2010). Despite the diversification of objectives and methods, those mentioned actions aim at learning in order to adapt (Malvezzi, 2015) and its effects are related to acquisition, maintenance, and transfer of knowledge, skills, and attitudes, or KSA's (Abbad & Borges-Andrade, 2014; Abbad, Pilati, Borges-Andrade, & Sallorenzo, 2012). Acquisition and retention are individual psychological processes that favor the appropriation of KSA's which will subsidize the development of new qualifications, while generalization and transfer are processes of applying those qualifications in activities and situations that are different from those promoted by training (Abbad & Borges-Andrade, 2014).

Learning is a term that refers to a wide event related to "changes that occur in the individual's behavior and are not solely resulting from maturation but also from the interaction with the context" (Abbad & Borges-Andrade, 2014, p. 238). However, this term has also been used as an equivalent to acquisition in the evaluation models of training proposed by Kirkpatrick in 1976 and Hamblin in 1978, according to Borges-Andrade, Abbad and Mourão (2012). The effects of training can be evaluated at for or five different levels in those models, comprising immediate results, as (a) the reaction of participants, and (b) the learning expressed by knowledge, skills and attitudes (KSA's) promoted by organizational process and which constitute the new developed qualifications. There is also a level

that match the individual effects in long term, as (c) the changes in the behavior at the job position, related to the transfer of qualifications to the workplace. Finally, there are two levels of data collection that do not refer to individual learning; (d) the organizational change level, related to the operational change due to the performance of trained professionals; and (e) the final value related to the alteration in production or services provided by the organization, or moreover, social and economic benefits resulted from training.

There are some arguments concerning the definition for the transfer concept that involve the complexity of the measure (Pilati & Borges-Andrade, 2004; Zerbini & Abbad, 2010). In the Brazilian scientific literature, training impact at work has been measured in two different ways. The impact in amplitude corresponds to the effects on the behavior at a job position (Abbad et al., 2012; Zerbini et al., 2012) and comprises all the qualifications needed to perform a job, as similarly proposed by Hamblin (Pilati & Borges-Andrade, 2004). Conversely, the impact in depth refers to the direct and specific effects of those training actions.

Transfer includes both wide effects and ones that are more specific, in the perspective adopted by Blume et al. (2010). Those effects related to the changes in the global behavior of the trained professional are assessed in terms of effectiveness. The measurement of transfer also occurs in terms of use when it refers to the strict application of the qualifications that were developed.

This discrepancy in the understanding of the concept amongst different authors obscures the appraisal of results from research on the effects of training. This study adopts the concept for training impact at work as an equivalent to transfer. It relates to changes in the professional behavior at a job position after training. Such changes include both measures (amplitude or depth) and correspond, respectively, to the measures of effectiveness or use, as defined by Blume et al. (2010).

Research reports present an imbalance in favor of reaction, learning and behavior at the job position levels, with special emphasis for the latest. The organizational change and the final value, both corresponding to the most comprehensive levels and related to efficacy and efficiency of organizations, represent a challenge to the area due to the difficulty in isolating those effects (Aguinis & Kraiger, 2009; Noe et al., 2014).

Besides the issues related to the investigation levels, still prevails the concern towards the scientific rigor applied to program evaluation. The inconsistencies generated by mixed results affect the predictive features of the variables and their potential implications. This fact could hinder the acknowledgment of critical aspects that must be observed by those who wish to enhance their training actions (Grossman & Salas, 2011; Mourão & Borges-Andrade, 2005).

A review of the Brazilian literature presented a critical analysis of the production on the transfer and impact of training at work and debated the concepts, definitions, and measures used in research (Zerbini & Abbad, 2010). A meta-analysis of 89 empirical articles published outside Brazil conducted a critical analysis on the impact of predictive factors in the transfer of training for different tasks and contexts (Blume et al., 2010). Lastly, Grossman and Salas (2011) raised ambiguities issues concerning the effect sizes of predictive variables of transfer.

The present study adopted the recommendations from those critical analyses as a guideline for this review. Its focus is on the reports in which the outcome variable was the transfer or impact of training at work, equivalent to the level of changes in the behavior at a job position. The analyses has taken into account (a) the compliance to gaps in the Brazilian scientific production, indicated by

Zerbini and Abbad³ (2010), and (b) the control for restrictions and methodological weaknesses indicated by Blume et al. (2010).

Method

The articles that report empirical research within the area of micro organizational behavior, published within the period of 1996 to 2015 by 16 Brazilian psychology and management journals were analyzed. The selected journals attend the following criteria: (a) a better classification than B2 in the evaluation of the *Sistema Qualis* from the *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* (CAPES)⁴; and (b) accessibility to the articles through their own website or a computer database⁵.

Amongst 56 articles that are related to formal learning, this review selected 24 articles that: (a) were related to empirical research which adopted training effects as outcome variable, at the level of change in the behavior at a job position; (b) used a quantitative or quali-quantitative approach with the objective of developing knowledge; (c) were evaluated by pairs and classified according to the categorization criteria previously established, as described by Borges-Andrade and Pagotto (2010)⁶. Figure 1 summarizes this selection process for the reviewed articles.

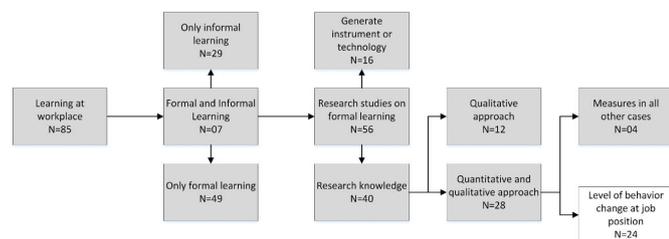


Figure 1. Scheme adopted for the selection/inclusion of articles.

Results

Tables 1 and 2 show the characteristics of 24 research studies that focused the level of change in the behavior at a job position. The selection of the articles occurred based on those criteria presented in the previous section.

Training consists of a multi-disciplinary field and presents relevance both in psychology ($n=12$) and management ($n=12$) journals. Within the investigated period, the journals *Revista Psicologia: Organizações e Trabalho* (rPOT) and *Revista de Administração Contemporânea* (RAC) published most of the articles.

Research studies intend, on the long run, to develop the field knowledge. Considering that the scenario indicated by research performed in the last five years reflects the search for progress, Table 3 summarizes the main suggestions for future research studies.

Discussion

Considering the constancy of interest from the researchers on training and the volume of research studies, what are the known results on the prediction for the impact on training in the change of behavior at a job position? Which are the gaps identified in previous reviews that persist in the area? How the methodological issues weaken or enhance the already found results? These questions will be answered in the following sections.

The path already taken: Prediction for individual and contextual variables and variables related to training

Formal learning has been systematic and periodically reviewed through the years. Brazilian and international reviews summarize the main results for the prediction of impact of training on work, although they equally revealed inconsistencies in the area (Aguinis & Kraiger, 2009; Merriam & Leahy, 2005; Zerbini & Abbad, 2010). Among the predictive variables that showed more robust results in the international literature, we can highlight cognitive ability, self-efficacy, motivation, usefulness perceived in training, behavior modeling, mistake management, realistic work environments, climate for transfer, opportunity for development, and follow-up (Grossman & Salas, 2011).

In general, those data resulted from an expansive and comprehensive review that included several research studies. In the Brazilian review conducted by Zerbini and Abbad (2010), a range of unpublished papers were analyzed. Thus, considering a specific scope of published research studies, it is plausible and interesting to observe some divergent points of those previously quoted results findings.

The generic models for training evaluation emphasize the contribution from individual, training and organizational characteristics for the effectiveness of training programs (Borges-Andrade, 2012). The models proposed in the analyzed research studies indicated that most of them considered this issue, as 58% of the studies ($n=15$) used a combination of individual and contextual variables, and variables from training design. There is a small number of research studies that included characteristics of training as a predictive variable ($n=7$). Among the more robust variables indicated by Grossman and Salas (2011), motivation and climate or support for transfer had more notoriety in the Brazilian literature.

This scenario indicates an acceptance of part of recommendations proposed by reviews in training. Although researchers keep the interest on individual variables, there is also the recognition of the relevance in aggregating variables from other levels. This decision contributes to obtain greater explanatory power of the training impact at work. Therefore, it is a good practice for research.

Considering the work context, the 24 revised studies presented characteristics that are similar to those found by Zerbini and Abbad (2010), with the most part originating from the public sector, followed by the private sector. This is similar to the pattern of the Brazilian research on organizational behavior. Despite the interest and investments of private organizations on training actions, public organizations are more likely to allow research studies than private organizations.

There is little advance in the analysis employed by researchers. Linear regression and analysis of variance were highlighted in their

³ These authors made a review of the Brazilian scientific production, including several published and unpublished papers. Those papers were produced between 1980 and 2008. Notwithstanding, the present review included only five articles previously reviewed by Zerbini and Abbad (2010).

⁴ The *Sistema Qualis* is used to classify the scientific production of graduate programs based on the evaluation of the articles published in scientific journals, in compliance with criteria that were previously established by the evaluation committees from the Psychology and Management knowledge areas. The present review only took into consideration the journals with the best classification in the system.

⁵ The 2015 editions of the journal *Psicologia em Estudo* were not available online, during the data collection period from May to June, 2016.

⁶ Those authors employed a process of review by pairs to classify papers in the organizational behaviour area. The present review used the same criteria. More information on this method is described by: Borges-Andrade, J. E., & Pagotto, C. P. (2010). O estado da arte da pesquisa brasileira em psicologia organizacional e do trabalho. *Psicologia: Teoria e Pesquisa*, 26(número especial), 37-50.

Table 1

Main characteristics of the variables included in research on the level of change in the behavior at a job position

Author of the article, year and journal	Measure complexity	Investigated predictive variables	Time period between variable data collection	Time period between the end of training and the measure of the outcome variable	Type of trained skill
Borges-Andrade et al. (2002) rPOT	Impact on amplitude	Individual and contextual	Single collection	Not informed	Not informed
Brant (2013) rPOT	Impact on amplitude	Individual	Collection in different moments	2 months	Open
Carvalho and Abbad (2006) RAC	Impact on amplitude and depth	Individual, contextual, and from training	Collection in different moments	3 months	Open
Costa and Vale (2003) rPOT	Impact on amplitude	Individual, contextual, and from training	Single collection	Various years	Open
Félix (2005) RAP	Impact on amplitude and depth	Individual and contextual	Single collection	Collection at the end of training	Open
Freitas and Borges-Andrade (2004) RAE	Impact on depth	Individual and contextual	Single collection	12 to 60 months	Open
Freitas et al. (2015) Psico PUC Campinas	Impact on amplitude	Individual	Collection in different moments	During training	Open
Gonçalves and Mourão (2011) RAP	Impact on amplitude	Individual	Collection in different moments	Between 3 and 4 months	Not informed
Joia and Costa (2007) RAP	Impact on depth	Individual	Single collection	Not informed	Open
Lacerda and Abbad (2003) RAC	Impact on amplitude	Individual and contextual	Collection in different moments	Minimum of 1 month	Not informed
Leitão (1996) RAUSP	Impact on amplitude	Contextual	Single collection	Between 3 and 12 months	Not informed
Lins and Borges-Andrade (2014) Estudos de Psicologia (Natal)	Impact on amplitude	Individual	Collection in different moments	4 months	Open
Meneses and Abbad (2003) RAC	Impact on amplitude	Individual, contextual, and from training	Collection in different moments	1 to 3 months	Open
Mourão and Borges-Andrade (2005) O&S	Impact on amplitude and depth	Individual	Collection in different moments	Not informed	Open
Mourão et al. (2013) rPOT	Impact on depth	Individual	Collection in different moments	Collection at the end of training	Open
Mourão et al. (2014) RAUSP	Impact on amplitude and depth	Individual and contextual	Single collection	3 months	Open
Pantoja et al. (2001) RAUSP	Impact on amplitude	Individual, contextual, and from training	Single collection	Up to 24 months	Open
Pantoja et al. (2005) Estudos de Psicologia (Natal)	Impact on amplitude	Individual and contextual	Collection in a single moment	Collection at the end of training	Open and closed
Pilati and Borges-Andrade (2004) Psicologia: Teoria e pesquisa	Impact on amplitude and depth	Individual and contextual	Single collection	3 months	Not informed
Santos-Filho and Mourão (2011) rPOT	Impact on amplitude	Contextual	Single collection	4 months	Open
Silva (2006) RAC	Impact on depth	Individual and contextual	Not informed	Not informed	Open and closed
Tamayo and Abbad (2006) RAC	Impact on amplitude	Individual and contextual	Collection in different moments	3 months	Not informed
Zerbini et al. (2012) rPOT	Impact on amplitude and depth	Individual and contextual	Single collection	3 months	Open
Zerbini et al. (2015) Psicologia: Ciência e profissão	Impact on amplitude	Individual	Single collection	After 9 months, minimum	Open

Table 2
Main characteristics of the research design on the level of change in the behavior at a job position

Author of the article and year	Source of the Predictive Variable	Source of the Outcome Variable	Variable with more predictive power	Explicative power of the model (Adjusted R ²)
Borges-Andrade et al. (2002)	Self assessment	Self and hetero assessment	Motivation (at individual and organizational levels)	Not applicable
Brant (2013)	Self assessment and objective data	Self assessment	Application strategy for what was learned (mediation)	0.57
Carvalho and Abbad (2006)	Self assessment	Self assessment and objective data	Response to results and drafting of business plan	0.31 (amplitude); 0.33 (depth)
Costa e Vale (2003)	Self assessment	Self and hetero assessment	Organizational support and training methodology	0.45 (hetero assessment); 0.15 (self assessment)
Félix (2005)	Self assessment	Self assessment	Hours of training (positive correlation) and organizational defense mechanisms (negative correlation)	Not applicable
Freitas and Borges-Andrade (2004)	Self assessment	Self and hetero assessment	Psychosocial support	Not applicable
Freitas et al. (2015)	Self assessment	Self assessment	Transfer of learning	0.42 (amplitude)
Gonçalves and Mourão (2011)	Self assessment	Self assessment	Response to training	0.24
Joia and Costa (2007)	Self and hetero assessment	Self and hetero assessment	Source of motivation	0.68
Lacerda and Abbad (2003)	Self assessment	Self assessment	Psychosocial support	0.61
Leitão (1996)	Self assessment	Self and hetero assessment	Corporate atmosphere	Not applicable
Lins and Borges-Andrade (2014)	Self assessment	Self assessment	Learning strategy	0.42
Meneses and Abbad (2003)	Self assessment	Self and hetero assessment	Psychosocial support (self and hetero assessment)	0.49 (self assessment); 0.47 (hetero assessment)
Mourão and Borges-Andrade (2005)	Self assessment	Self assessment, hetero assessment, and objective data	Application in personal life and at the community	Not applicable
Mourão et al. (2013)	Self assessment	Self assessment	Expectations for the performance	0.14
Mourão et al. (2014)	Self assessment	Self assessment	Support to training application	0.63 (amplitude); 0.71 (depth)
Pantoja et al. (2001)	Self assessment and objective data	Self and hetero assessment	Psychosocial support	0.37
Pantoja et al. (2005)	Self assessment	Self assessment	Psychosocial support and conservatism (motivational type)	0.35
Pilati and Borges-Andrade (2004)	Self assessment	Self and hetero assessment	Support to transfer and task features	0.37 (amplitude); 0.05 (depth)
Santos-Filho and Mourão (2011)	Self assessment	Self assessment	Affective commitment	0.20
Silva (2006)	Self assessment	Self assessment	Managerial and social support	0.37
Tamayo and Abbad (2006)	Self assessment	Self and hetero assessment	Psychosocial support (self assessment) and material support (hetero assessment)	0.30 (self assessment); 0.37 (hetero assessment)
Zerbini et al. (2012)	Self assessment	Self assessment	Support to the training application	0.44
Zerbini et al. (2015)	Self assessment	Self assessment	Learning strategies	Not applicable

analysis. Few research studies have used other methods. Studies that applied structural equation modeling were reported by Pantoja et al. (2005) and by Pilati and Borges-Andrade (2004). The canonical correlation analysis was also used (Leitão, 1996). In general, the same scenario was pointed by Zerbini and Abbad (2010). This similarity is associated with the fact that, since 2010, just ten published research reports focused on the change of behavior at a job position. More time and more studies are required, in order to allow significant changes to occur in the scenario already indicated. It is also necessary to consider the aims of those research studies and to question whether those methods were satisfactorily employed. Available instruments and attractive results from popular methods can influence decision making related to future research design decisions.

According to the obtained data, the gaps related to the investigation of prediction of sociodemographic data and

cognitive-behavioral characteristics persist in TD&E area. They were investigated by few studies (Carvalho & Abbad, 2006; Costa & Vale, 2003; Joia & Costa, 2007; Milaré & Yoshida, 2009; Mourão & Borges-Andrade, 2005; Zerbini et al., 2012). There is also the need for studies in the Third Sector, which has been slightly approached by TD&E researchers. Due to the need to eliminate ambiguities in the area and deepen the knowledge on more solid correlations already identified, experimental designs would be relevant, or the use of analysis methods such as structural equations, that allow the investigation of mediating and moderating effects.

Although those recommendations can promote better practices in research, it is reasonable to make some notes. The insertion in organizational contexts and the complexity of experimental designs may diverge from initial organizational interests. The search for fast findings may result on constraints to the researcher.

Table 3

Proposals for future research studies (2011-2015)¹

Article	Proposal of research schedule
Gonçalves e Mourão (2011)	Investigation of motivational and demographic individual characteristics in a more detailed manner; Development of research in the private sector; Differentiation between courses that are offered internally and outside the organization; Investigation of the impact from training by organizational sector.
Santos-Filho e Mourão (2011)	Investigation of the tripartite model for organizational commitment proposed by Mayer and Allen (1991), aiming to confirm its validity; Development of multidimensional models for affective commitment; Addition of individual variables with global features as predictive variables for training impact; Investigation of professional development (and not only TD&E actions).
Mourão et al. (2013)	Investigation of the relation between attitude towards the computer and <i>e-learning</i> ; Effects of the course design and debate tools on learning results; Effects of the used interface on younger and older users; Use of distance education transfer indicators.
Brant (2013)	Influence of situational and individual factors in the relationship between learning and training impact; Use of hetero assessment measures; Diversification of the sample; Use of objective measures for the evaluation of training impact;
Lins e Borges-Andrade (2014)	Study of informal and shared leadership; Analysis of political, technical and management elements that impact on the development of leaders operating in the public sector.
Zerbini et al. (2015)	Investigation of the differences in the use of learning strategies within different work contexts; Analysis of the effect made by the relationship of participants, with the virtual environment, on the training impact.
Freitas et al. (2015)	Longitudinal study for the evaluation of training impact and learning transfer.

Nota. ¹The studies performed by Zerbini et al. (2012) e Mourão et al. (2014) did not present proposals for research.

The path to be taken: Methodological remarks

The progress in the TD&E area contributed to the acceptance of TD&E as science (Mourão, 2015). Despite the findings, there are persistent gaps that deserve the attention of researchers from the area (Zerbini & Abbad, 2010). However, the existing inconsistencies demand a critical analytic positioning that may provide a reliable evaluation about the return on investments in training activities. This demand has been justifying the majority of the developed research (Aguinis & Kraiger, 2009; Blume et al., 2010; Zerbini & Abbad, 2010).

The international literature was recently reviewed, considering methodological issues that contributed to the production of research bias or inflation of correlation results (Blume et al., 2010). When possible, the present review applied the same criteria. Tables 1 and 2 synthesized relevant information under methodological aspects that impact on the quality and robustness of results. The need to trade relations between the academic production and the professional practice justifies those concerns, since the available knowledge has been slightly useful to guide professionals that intend to maximize training impact (Grossman & Salas, 2011).

The measuring complexity. An important differentiation in research on the training impact at work concerns the complexity involved in measuring. Training impact on depth consists in applying at work those competencies that were trained. It is directly related to the aspects of performance derived from the instructional objectives. Training impact on amplitude involves the effects from the TD&E actions and the global performance of the professional (Pilati & Borges-Andrade, 2004). Even though they are correlated, these constructs differ in their definition and prediction. Measuring in depth is dependent upon the specific objectives of each training program (Zerbini et al., 2012). The measure in amplitude has been more used ($n=13$) than the measure in depth ($n=4$). This may be explained by the fact that measures in depth demand specific knowledge on the instructional objectives and on the reality of work context. There are also difficulties in validating such instruments that often cannot be subjected to the most commonly used tests. Despite those demands, some studies looked for the combination

of both measures ($n=7$). This has brought contribution to the area as it generates knowledge about the differences in prediction models that use measures in amplitude and depth. These differences may influence the prediction intensity (Blume et al., 2010).

Time interval. The inflation in the correlation between predictive variables and training impact, caused by simultaneous data gathering, consisted in one of the main criticisms pointed out by Blume et al. (2010). The results indicated that there is an effect over the correlation when there is no time spacing between the predictive and outcome variables or between this variable and the end of training, when the focus is on the change of behavior at a job position. Most research studies performed a simultaneous data gathering from predictive and outcome variables ($n=13$) while some gathered those data in different time periods ($n=10$). In one case there is no information about the interval between data gatherings. The majority of studies still considered a time interval between the end of the training action and the verification of its impact ($n=16$). For the latest, some articles did not report if there was or which was the considered interval ($n=4$), and some studies performed the data gathering during or at the end of the action ($n=4$).

Researchers with a longitudinal design consider implications of temporality in their results, but this point has not been received the same attention regarding the intervals between collections in cross-sectional studies. Although transversal designs allow collecting data just one time, this practice can promote bias in the results. Gathering data on performance immediately at the end of training can be considered in compliance only with research at the levels of reaction and learning (Abbad, Zerbini, & Borges-Ferreira, 2012; Mourão & Marins, 2009). The interval between the end of the training action and the verification of its impact is crucial so that the trainee has the opportunity to transfer his/her competencies into the context of work and present behavior changes at a job position.

The achieved skills. The contribution of individual characteristics, training characteristics, and organizational context for a higher power of impact is widely known (Merriam & Leahy, 2005; Zerbini & Abbad, 2010). Among the variables from this action, characteristics like modality of teaching, instructional resources, and instrumental

value received attention (Meneses & Abbad, 2003; Mourão et al., 2013; Silva, 2006). However, the type of achieved skill consists of an aspect slightly reported in the analyzed Brazilian research studies. This aspect gains relevance for the investigation of impact of training, since it may be used as a parameter for research design and definition of time needed for data gathering after the end of training. The achieved skills may be categorized as open (when the trainee can decide on a course of action for its use at work) or closed (when characterized by procedures that conduct the skills use and this use is based on rules) (Blume et al., 2010). Although some studies did not report the characteristics of achieved skills ($n=6$), the majority focused on open skills ($n=16$), while few ($n=2$) involved open and closed skills. Open skills tend to be prioritized when considering the strategic objectives of organizations. Closed skills are common in technical and computing training actions. Laboratory research can also stand out by their focus on more specific skills and occasionally considered as closed skills (Blume et al., 2010).

The source of information. The concern about self-referring data is not exclusive to training research. In fact, the specificity of the object of study in psychology drives the development of self-assessment instruments that allow the evaluation of the individual perception on several processes and objects. In order to minimize the effects of results inflation, the use of objective and self-assessment data is recommended (Abbad et al., 2012). While the measuring of predictive variables differentiated itself by the exclusive use of self-referring instruments ($n=21$) and few combinations with other measures ($n=3$), the training impact measurement presented higher balance between self-referring instruments ($n=13$) and its combination with the use of hetero-assessment or objective data ($n=11$). The creation of instruments in the training area can be pointed out as a facilitator for the implementation of self-assessment in impact evaluation. We shall consider that most predicting variables of training impact consist of phenomenon that cannot be easily accessed in an objective manner. They may demand a subjective perception from the participant. Therefore, the nature of variables shall be considered in the development and implementation of measures, considering that "there is no such thing as one better method, but more adequate methods for different goals" (Mourão & Meneses, 2012, p. 53).

Results. Confirming what has been systematically appointed by the literature, organizational support (including climate for transfer, organizational climate, psychosocial support, material support, among others that may be indicated) emerged as one of the variables with more predictive value. This has been reported by several Brazilian authors (Freitas & Borges-Andrade, 2004; Lacerda & Abbad, 2003; Leitão, 1996; Meneses & Abbad, 2003; Pantoja et al., 2001; Pilati & Borges-Andrade, 2004; Silva, 2006; Tamayo & Abbad, 2006; Zerbini et al., 2012).

Suggested research. Progress of a knowledge area does not occur without research. Empirical studies help both the development of answers to existing gaps in the area and the formulation of new questions that allow a deeper understanding of complex constructs about human learning. When considering the studies performed in the last five years, a higher concern was observed on indicating possible measures related to the investigated variables (Gonçalves & Mourão, 2011; Lins & Borges-Andrade, 2014; Santos-Filho & Mourão, 2011; Zerbini et al., 2015). However, there are also suggestions that focus on methodological needs, as the use of hetero-assessments and objective measures (Brant, 2013), development of longitudinal studies (Freitas et al., 2015), and multidimensional models (Mourão et al., 2013).

Possible paths: Future challenges

In organizational and work contexts, research on formal learning presents more systematized results in comparison to those found for informal learning (Manuti et al., 2015; Noe et al., 2014). The research studies on training impact at work have been greatly contributing for this differentiation. However, besides the need to explore wider levels (as the impact on the organizational behavior or the final value), there may be progress from studies on the level of behavior change at a job position. Such contributions can be mainly obtained through more methodological rigor, given the predominance of correlational designs in the area. There are several already known correlations between individual and organizational variables and impact of training and some of them are more robust than others are. For a better measurement of the intensity and direction of those relationships, Brazilian studies with experimental design are needed, which allow a higher control of the investigated effects.

Researchers need to adopt countermeasures to avoid divergence between search and organizational aims. Changes in the conception of the trainee role must be considered. Besides promoting an active role in the learning process, as indicated by results from the reviewed research studies, organizations also must be encouraged to explore alternative methods for the evaluation of training. Researchers can inspire such changes, by recognizing and focusing, as much as possible, at the organizational aims.

One peculiarity of the area is the recognition of the interaction between variables from individual and organizational levels in the production of training impact; when taken alone, those variables present low predictive value. Although the models are prioritizing this interaction, multilevel studies are needed. They would allow a more accurate investigation on how such variables interact and produce effects in different levels. Notwithstanding, the sources of information are relevant aspects in the development of research. Given that learning and the change of individual or organizational behavior can be measured, the use of triangulated information sources is important for research development, as a way to optimize methodological design and to obtain better results.

Finally, some gaps related to the investigated fields also deserve attention, in order to deepen knowledge in the area. Although the characteristics of the training actions are being studied, it is possible to obtain a greater delimitation of the obtained skills, concerning their further use (open or closed) and also their domain (predominantly cognitive, affective, or psychomotor). Furthermore, the public and private sectors were studied in similar proportions, while the Third Sector was neglected by research. Investigating the Brazilian Third Sector presents itself as an interesting and feasible alternative, which is capable of contributing to the area, given its specificities and size and the possibilities of achieving wider levels. This sector is strongly connected to the society; therefore, it facilitates the investigation at the final value level. Using the best efforts to tread alternate paths seems to be the best strategy to promote growth and maturation of the research reviewed hereby. Results are promising so far, although with inconsistencies.

There are several research challenges. They are mainly related to the constraints of the organizational context and some may be related to the learning process. There is a range of possibilities in order to better investigate training impact at work. Improving methodological practices is not a fashion issue, but a needed path to approach academic and professional aims and to ensure the development of relevant and impactful competences at the workplace.

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