Safety Science 86 (2016) 1–9

Contents lists available at ScienceDirect

Safety Science

journal homepage: www.elsevier.com/locate/ssci

Unexpected events: Learning opportunities or injury risks for apprentices in low-skilled jobs? A pilot study

Marie Laberge [a,b,c,*], Bénédicte Calvet [b,c], Marc Fredette [d], Nassim Tabet [d], Aurélie Tondoux [b], Dolores Bayard [b], Curtis Breslin [e]

[a] University of Montreal, Rehabilitation School, Faculty of Medicine (Pavillon Parc), C.P. 6128, succursale Centre-ville, Montreal, QC H3C 3J7, Canada
[b] CHU Ste-Justine Research Centre, Marie Enfant Rehabilitation Centre, 5200 Bélanger East Montreal, QC H1T 1C9, Canada
[c] CINBIOSE, UQAM, Case postale 8888, succursale Centre-ville, Montréal, QC H3C 3P8, Canada
[d] HEC Montreal, Department of Management Sciences, 3000, chemin de la Côte-Sainte-Catherine, Montréal, QC H3T 2A7, Canada
[e] Institute for Work & Health, 481 University Avenue, Suite 800, Toronto, ON M5G 2E9, Canada

ARTICLE INFO

Article history:
Received 7 July 2015
Received in revised form 7 January 2016
Accepted 5 February 2016
Available online 26 February 2016

Keywords:
Vocational training
Work-related injury
Manual job
Work strategies
Supervision
Young workers

ABSTRACT

Inexperienced workers are more prone to experience occupational injuries. By definition, a work accident is a sudden or unforeseen event that contributes to an injury. This pilot study aimed to understand the relationship between unforeseen events, their contributing factors, the responses to these events, and the injury risks among young apprentices.

Nine apprentices (15–17 yr old) in different companies were videotaped whilst doing normal work tasks (total 79.5 h). Unforeseen events were described according to an observation grid constructed for this study; the following variables were characterized: unforeseen events, immediate contributing factors, strategies (individual vs. collective) and injury risk. All unexpected events observed by trained raters were coded ($n = 554$). Simple logistic regressions were made to determine the odd of being at risk of injury. The variable "activity sector" was used as control. Falling/dropping object (25.5%) is the most prevalent unexpected event (UE). The most important contributing factor is related to Material/products (44.1%), and Individual strategies were most frequently used by apprentices (81.5%). However, regressions showed that UE related to Handling and Equipment are the most associated with injury risks.

Collective strategies to manage UE seem to have a protective role. This study illustrates the duality associated with unexpected event: the potential of those events to develop competencies or the risk of injury associated. Some implications for schools, decision-makers and employer are discussed.

1. Introduction

Many cross-sectional studies and literature reviews indicate that workers in the first few months of their job (i.e., new workers) have an increased risk of work injury (Shaw et al., 2001; Crook et al., 2002; Breslin and Smith, 2006; Breslin et al., 2007; Lidal et al., 2007; Laberge and Ledoux, 2011; Morassaei et al., 2013). This elevated risk remains even when sociodemographic and work-related variables (e.g., occupation) are controlled (e.g., Morassaei et al., 2013). An increased risk of injury among new workers is of particular concern for young workers and those who engage in temporary employment because by moving from job to job they repeatedly expose themselves to this "high-risk" phase of employment.

This high risk for newly hired workers could be explained by a combination of unfamiliarity with identifying and controlling hazards, and a lack of effective safety training (Breslin and Smith, 2006). Efforts to reduce work injury include the identification of risk factors (e.g., hazards) and implementing prevention programs to eliminate hazards or reduce workplace risks.

Despite this body of knowledge, injuries continue to occur in workplaces. In actual work situations, workers may not base their work strategies on aggregated statistical knowledge but, rather on contextual factors, such as variability or incidental situations. Thus actionable information requires microanalysis of contextual settings. By definition, according to the Quebec Act Respecting Industrial Accidents and Occupational Diseases, an industrial accident means a *sudden and unforeseen event, attributable to any cause, which happens to a person, arising out of or in the course of his work*

* Corresponding author at: University of Montreal, Rehabilitation School, Faculty of Medicine (Pavillon Parc), C.P. 6128, succursale Centre-ville, Montreal, QC H3C 3J7, Canada. Tel.: +1 514 343 6111x17354.
E-mail address: marie.laberge@umontreal.ca (M. Laberge).

http://dx.doi.org/10.1016/j.ssci.2016.02.005
0925-7535/

and resulting in an employment injury to him. Commonly, in real-life situations, the capacity to avoid an accident depends on strategies developed when a situation changes and then, on the experience gained encountering subsequent similar situations. It is thus linked to job learning processes. Several authors discuss this topic in terms of work interruption and work recovery. Work interruptions are known to contribute to accidents and decrease productivity in domains such as aviation, hospitals, and offices (Boehm-Davis and Remington, 2009). Leplat (2011) defined "work interruption" as a rupture in the normal action course that is caused by *internal or external events*. Many situations can be associated with an interruption, such as distraction, memory failure, unexpected demands, and obstacles. The main focus of this article is those events that can induce an interruption among non-experienced young workers.

Perrenoud (1999), who had greatly contributed to the advancing of education sciences by his approach to competency-based development, explains two types of unexpected event:

- those that can be expected, but the time of the occurrence is not; this can be called "relatively unexpected" or
- those that are completely unforeseen or new to the worker; this can be called "completely unexpected".

The concept of *uncertainty* is essential to understand how such events generate reactions that might be associated to an accident. Leplat (2011) brings up the premise of the accident analysis method developed by the French *Institut National de Recherche et de Sécurité* (INRS): *If things had happened as planned, the accident would not arise*. In this assumption, the analysis consists to seek the sources of the accident in the variations of the situation. In actual context, *unexpected events* such as breakdowns or malfunctions, compel workers to change their work strategies to restore the situation and reach the objectives, despite what happened (Noulin, 2002). This mechanism is called *recovery*. It is closely linked to the «self-regulation process» described by Leplat (2011) and St-Vincent et al. (2014). The self-regulation process is a constant adaptive process to cope with variability. This self-regulation process is expressed in work activities and can be observable via different strategies and actions in function of the context (St-Vincent et al., 2014). Apprenticeships are intended as a period to learn these self-regulatory skills.

Perrenoud (1999) explained how the capacity to master unforeseen events corresponds to high level of competency; it seems to be the challenge of situational learning. Therefore, for an apprentice, unexpected situations are mostly completely new (second scenario); gradually, those situations become "relatively unexpected". Through this process, work strategies are developed, first randomly, and then, planned and refined. At the end, a repertory of appropriate "know-how" is created and can be used in the right situation, especially to avoid injuries. Many researchers described this phenomenon as the *protective role of experience* (St-Vincent et al., 1989; Cloutier, 1994; Millanvoye and Colombel, 1996; Avila-Assunçao, 1998; Gaudart and Weill-Fassina, 1999; Vézina et al., 1999; Gonon, 2003; Chassaing, 2004; Cloutier et al., 2005; Denis et al., 2007; Ouellet, 2009). Another protective factor according to Caroly (2010) concerns the collective activity regulation (e.g., interactions with co-workers and supervisors on how to respond to unexpected events); this process allows a better division of tasks and different knowledge sharing opportunities about work situations.

The conceptual frame used in this study is the *Human Activity Self-Regulatory Process* model (Shaw et al., 2013) derives from Activity Theory (Vygotsky, 1978; Leontyev, 1978) and based on methods of work activity analysis developed by ergonomists (Vézina, 2001; Guérin et al., 2007; St-Vincent et al., 2014; Laberge et al., 2014) (see Fig. 1). The model describes how determinants of work activity, by the self-regulatory process they induce, might factor into a worker's ability to overcome health problems and maintain productivity. Concretely, this model sees workers in a continual process of self-regulation whilst carrying out job tasks in relation to work context: employer demands and expectations, conditions and means provided by the employer, as well as social context. Decisions about how to perform work activities in connection with context is a constant struggle to maintain

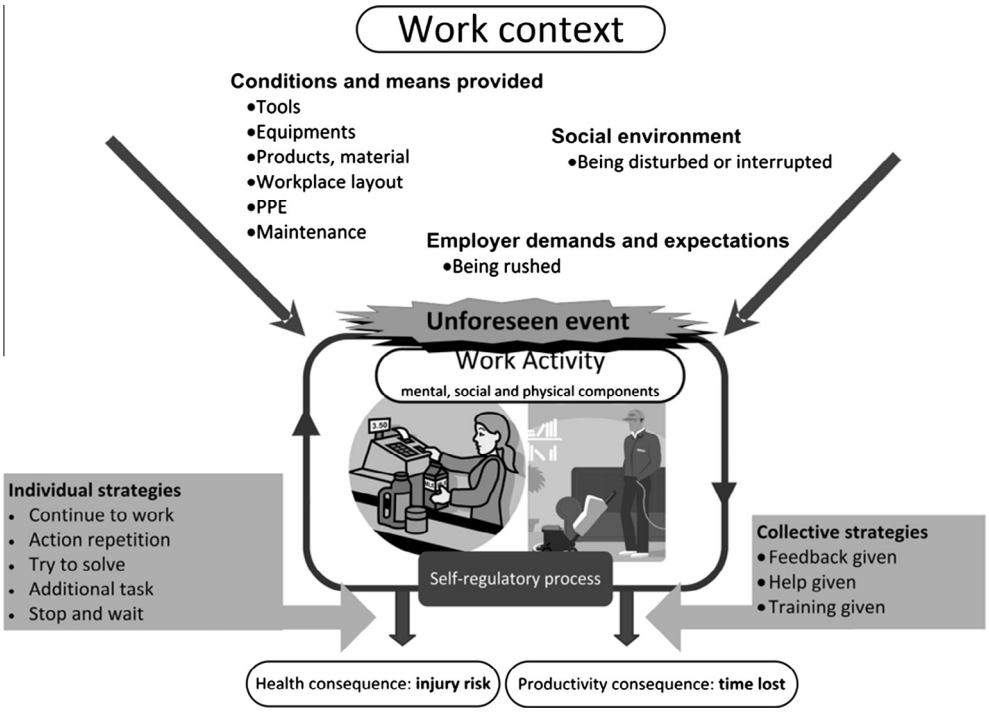

Fig. 1. Modified version of the *Human Activity Self-Regulatory Process* model.