

ERGONOMICS AND THE TRANSLATION PROCESS

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The translation process can be regarded as a complex system involving many agents, organizational factors such as workflow, communication processes, project management, job security, and translator status. Environmental factors in the physical sense (e.g. lighting, temperature, air quality, space) as well in the broader sense of the role of translation and translators in the economy and society as a whole can also influence the process. Viewing translation from an ergonomic perspective can provide an appropriate framework to understand the impact of such factors on the demanding bilingual activity that translators engage in. Because their work requires close attention and concentration, translators have to exert energy and ultimately cognitive resources to compensate for the distraction of any physical discomfort, delays in computer responsiveness, or frustration with organizational problems. In this article, the relevance of ergonomics and the implications of putting the translator and their translation processes in focus are discussed in light of recent research.

Keywords: translation process, ergonomics, professional translators, translation workplace.

1. Relevance of ergonomics to translation

As professional communicators, translators are expected to create high-quality texts that meet the needs of their clients and readers while at the same time being subject to physical, temporal, economic, organizational, and cultural constraints. They perform the demanding cognitive act of producing reader-appropriate texts in a target language while simultaneously processing information from source and parallel texts and juggling client and employer expectations of both the process (i.e. efficiency) and the product (i.e. quality). At the modern translation workplace, the increasingly heavy reliance on language technology has added to the complexity of this dynamic system and made it increasingly important to understand the effect of various factors on translator efficiency and the translation process.

Although definitions of ergonomics vary somewhat, the one published on the website of the International Ergonomics Association (IEA) captures current thinking on the topic:

Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance (IEA).



The first documented use of the term 'ergonomics' was by W. Jastrzebowski (2006) in 1857 in a philosophical treatise. According to a meta-analysis (Licht, Polzella and Boff 1989), definitions of the word started appearing in the literature in the 1960s. Before that, the terms 'human factors engineering' and 'human factors' were used to mean much the same thing. These terms share the aim of describing how non-human elements in a system should be adapted to fit the needs of humans in order to enhance the latter's comfort and performance. In other words, systems should serve their users and not the converse. It can be argued that ergonomics is essentially the human side of usability (ISO 9241; Norros and Savioja 2007), with its focus on the user rather than on machines or tools. Enhancing comfort can contribute positively to people's well-being and possibly lower the risks of injury, whereas enhancing performance can be related to decreasing the time needed to perform a task and reducing the number and/or severity of errors.

According to the IEA, this can be done using "a holistic approach in which considerations of physical, cognitive, social, organizational, environmental and other relevant factors are taken into account." The IEA explains that there are three main domains of specialization within ergonomics: physical, cognitive, and organizational. The physical domain, defined rather technically by the IEA as "human anatomical, anthropometric, physiological and biomechanical characteristics as they relate to physical activity" is the one that is probably most often associated with ergonomics. It relates to workplace equipment, layout, repetitive movements, safety, and health. A large body of research into physical ergonomics in the 1990s culminated in good practice recommendations for computer workstations and office ergonomics (e.g. CCOHS 2011; Ijmker et al. 2007; Salvendy 2012).

Since professional translators spend much of their day thinking and working at a computer, physical ergonomics is very important for them. The multi-activity task of translation can easily cause cognitive overload and stress since professional translators have to read the source text in one language, do research in one or more languages, and write and revise in the target language while thinking, retrieving, and evaluating information from internal and external resources under tight temporal constraints. Just as models have been proposed to explain the effort or cognitive load of interpreting (e.g. Gile 2009), the construct of the mental load has been used to explain how various factors can affect translation performance (cf. Muñoz 2012, 177).

Moreover, many translators work in offices that have sub-optimal conditions for intensive text work, such as other people talking, making phone calls or moving around, other ambient noise, inadequate lighting, and uncomfortable temperatures. Physical factors, such as the design of desks, office chairs, computer keyboards, and other input devices like trackpads and mice can all influence the performance of the people working at computers. They can also represent risk factors for health problems. Keyboarding and using input devices are activities that involve more than just the hands or lower arms; constant repetition of movement can also cause an overload of muscles of the upper extremities and back and lead to hand and wrist tendonitis (cf. Lavault-Olléon 2011a; Lavault-Olléon 2011b).



The second major domain defined by IEA is cognitive ergonomics, which is “concerned with mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system.” It is usually associated with features of human-computer interaction such as the design, organization, and operation of user interfaces, but also includes mental load, decision-making, and stress related to work. The assumption behind optimizing the ergonomics of user interfaces is that if they are in alignment with natural cognitive processes then they will be easier to use and lead to more efficient performance, fewer errors, and less stress (e.g. Beale and Peter 2008).

Cognitive factors involved in translation work include the subject matter and quality of source texts as well as their terminological, conceptual and linguistic complexity. Human-computer interactions, information sources, and language technology are also all factors related to the cognitive ergonomics of a translator’s workplace. In light of machine solutions being a part of virtually all translation tasks at modern workplaces (see O’Brien 2012), improving cognitive ergonomic conditions has become increasingly important. In her discussion of translation as a form of human-computer interaction, O’Brien points out that, in addition to its three most commonly cited advantages (speed, quality, and cost), translation technology can relieve translators of tedious tasks and the effort of trying to recall or retrieve previous translation solutions.

The third main domain referred to by the IEA is organizational ergonomics, which “is concerned with the optimization of sociotechnical systems, including their organizational structures, policies and processes.” This recognizes that people work within a system that includes not only tools, equipment, and computer interfaces but also other people. Topics relevant to organizational ergonomics include teamwork, collaboration, communication, and teleworking (see Vink and Kantola 2011) as well as feedback and quality management (e.g. Ehrensberger-Dow and Massey 2017).

Recent developments in technologies, communication speed, and the availability of information sources have had a huge impact on the translation profession. The entrenchment of language technology in the industry has forced language service providers to develop and integrate processes and organizational structures in order to remain competitive while maintaining quality standards for their clients (see, for example, ISO 17100). Increased use of computer-assisted translation (CAT) tools has resulted in impressive productivity gains, but it has also substantially changed the activity of translation itself (e.g. O’Brien 2012; Pym 2011; Pym 2013). One consequence of this is the increased influence of technological and organizational factors that can constrain translators’ agency and affect their decision-making.

Translation scholars (e.g. Grass 2011; Olohan 2011) have argued that, by largely failing to address human and organizational aspects in the design and workflow deployment of CAT and project management technologies, software developers and Language Service Providers (LSPs) have been increasingly disempowering and alienating translators. This may diminish translators’ commitment and sense of personal responsibility, with a negative impact on their professional identity and self-concept. Potential organi-



zational issues at the translation workplace also include structures, processes and policies related to equipment and software procurement, teamwork, communication, feedback, and quality management. There is a large potential for poor ergonomics to have detrimental effects on the people in the centre of the translation process, as explained below.

2. Translators in the centre of the translation process

An ergonomic perspective on the translation process is congruent with Chesterman's (2009, 20) proposal to broaden the classic 'map' of translation studies to include a branch devoted to a study of translators. Putting the human in the centre this way, as the discipline of ergonomics does, allows us to explore what makes the products and processes of human translation different from machine translation (MT) solutions. The added-value of human translation includes novel solutions, stylistic choice, and culture-appropriate lexis and references, which are related to uniquely human traits such as creativity, discourse awareness, and reader empathy. These constructs are consistent with an appreciation of human cognition that extends beyond the boundaries of mental processes and rational decision-making to include notions of situatedness and embeddedness (cf. Englund Dimitrova and Ehrensberger-Dow 2016; Muñoz 2016a).

Translation can thus best be viewed as an activity situated in a particular time, place, society, and discourse, all of which can influence the decisions that translators make as they choose the best way to express the meaning and message of a source text to meet the informational needs of their target audience and the requirements of their clients. It is a complex bilingual cognitive activity that takes place within a dynamic system involving multiple agents and human-computer interactions in settings that can range from a kitchen table in a freelancer's house to a desk in an open-plan office of a busy commercial language service provider. At the highly-technologized computer workplaces that have become a standard feature of most freelance work and LSPs, translating has become a highly screen-intensive line of work that demands computer and information literacy in addition to familiarity with language technology and CAT tools. Ideally, the tools that translators use lighten their mental load (cf. Muñoz 2012), help them optimize their performance, and relieve them of tedious tasks such as translating the same sentence several times or ensuring consistent terminology. In reality, certain features in newly-designed or upgraded language technology systems can seem rather counter-intuitive to their intended users, thus having to be consciously remembered and adding an unnecessary load to cognitive resources.

In the past couple of decades, translation process researchers have made substantial contributions to our understanding of competences needed as well as problem-solving, resource use, and decision making during the act of translating. During this time, there has been a growing realization that simple models are essentially too limited in scope to adequately explain an activity that is situated in a temporal, spatial, and discursive context (cf. Chesterman 2013; Muñoz 2010; Muñoz 2016b). For this reason, the theoretical



framework of situated cognition (e.g. Robbins and Aydede 2008) has started to have an impact on translation studies (e.g. Risku 2002). In essence, situated cognition assumes an extension of human cognition from the mind to the physical and social situation in which individuals find themselves (e.g. Clark and Chalmers 2010; Menary 2013). As such, it can help explain, and in some cases predict, how humans and machines interact.

Pym (2011) reasonably maintains that the technologization of the translation profession has led to the extension and externalization of human memory. For example, CAT tools and editing software can free up valuable cognitive resources for decision-making and higher-order problem solving by decreasing the load on working and long-term memory, and intuitive interfaces and functionalities make it easier for translators to bring their expertise to bear. The centrality of technology to the modern translation workplace is amply demonstrated by a recent European language industry report (ELIA 2018). A survey of 1285 LSPs from 55 countries shows almost all of the companies and approximately 87% of individual professionals using CAT tools, and 76% of the companies having a translation management system. Despite the undisputed importance of technology and workflow management to the translation profession, a number of translation scholars have expressed concern that the industry has yet to properly address technological and organizational aspects of the socio-technical systems in which translators are employed. They claim that failing to do so can disempower and alienate such professionals, potentially undermining their commitment, their concept of agency, and their sense of responsibility for the decisions they make (e.g. Kinnunen and Koskinen 2010).

3. Recent research into the ergonomics of translation

There is no single picture of the ergonomics of professional translation: a large-scale survey completed by translators from almost 50 countries revealed that profiles differ depending on employment condition, age group, number of hours worked per week as well as many other factors (see Ehrensberger-Dow et al. 2016 for more details). Nevertheless, the topic of ergonomics is gaining attention from the translation studies community. The call for empirical research to inform theory-building, training, and practice is being answered using various methods ranging from workplace observations to experiments in lab settings. This research is grouped below roughly into the categories used by the IEA, although their tripartite classification is inadequate to capture the situated activity of translation, in which physical and organization conditions are intrinsically linked to the cognitive process.

3.1. *The physical ergonomics of translation*

Professional translation is not usually thought of as a physical activity, but analyses of recordings of translation processes done in the lab by professionals showed that on average they typed approximately 1,000 characters



and spaces and made over 80 mouse clicks within 15 minutes (Ehrensberger-Dow and Massey 2014, 72). These observations were confirmed by the translators' responses to certain questions in interviews after they commented on their translation processes. Although they basically seemed satisfied with their usual workplaces, all of them spontaneously mentioned issues related to ergonomics, such as the impossibility of working standing up in their offices and the (inadequate) size of their computer screens. The latter complaint was related to the limited space available for inputting target text because of the number of menus and optional functions in the CAT tools. Some of the translators also expressed their concerns about contextual factors such as ambient noise, furniture, and floor plans in light of an office move due to take place shortly after the interviews were done.

Since translation is generally a seated activity done indoors, physical factors such as the design of desks, chairs, office layout as well as ambient noise, lighting, and temperature can influence translators' performance, just as they do for other office workers (see Salvendy, 2012 for a general overview). In a recently completed interdisciplinary study (Meidert et al. 2016), occupational therapy and translation studies researchers visited professional translators at their workplaces to perform ergonomic assessments and observe their activities as they worked. The workplaces that were assessed in companies and institutions evinced a high ergonomic standard overall, whereas the ergonomics of most of the freelancers' workplaces was sub-optimal. However, even at the dedicated workplaces with ergonomic furniture and equipment, most of the settings had not been adjusted correctly for the individual translators.

This is consistent with the findings from an exploratory survey study of freelancers and commercial translators in two countries (Ehrensberger-Dow and O'Brien 2015) and confirmed in a much larger international survey of over 1,800 professional translators (Ehrensberger-Dow et al. 2016). Proportionately fewer freelancers have a dedicated workplace, a large enough desk, or their elbows at the right position when keyboarding. Far more of them use laptops with small screens, which can increase the risk of eyestrain. These issues would be relatively easy to remedy since information on ergonomic posture and workplace set-up is freely available on the internet from reliable sources. However, freelance translators working from home might actually be compensating for certain non-ergonomic physical features by having much more control over the room temperature, amount of fresh air, airflow, and lighting than institutional and commercial translators working in shared offices do. All of those factors can affect concentration, which illustrates the overlap of physical and cognitive ergonomics.

3.2. Cognitive ergonomics of translation

The notion of cognitive ergonomics is often associated with engineering, where it usually refers to the design, organization, and operation of user interfaces. This is an area that is highly relevant to translation, of course, with



its increasing reliance on computer-aided translation (CAT) tools ranging from spelling and grammar checkers to complete solutions that include translation memory (TM), terminology tools, concordancers, workflow organization, and links to MT. As early as the 1980s, some concern was expressed about the ergonomics of MT (e.g. Bevan 1982) yet relatively little research on translator-computer interaction has been done in the meantime, leading O'Brien (2012, 116) to suggest that "cognitive-ergonomic studies of translation tools and the translation process itself" would be beneficial. It is important to understand the reality of professional translation as translators cope with the transition of their work becoming increasingly machine-driven.

Translators interact with the tools they use, adapting them to suit their needs if possible or perhaps, more worrying from an ergonomic perspective, adjusting their cognitive processes to fit the machine. This has been discussed with respect to TM (e.g. O'Brien, O'Hagan and Flanagan, 2010), post-editing MT (Mesa-Lao 2014), integration of MT in TM (Teixeira 2014), and the usability of tools in general (Taravella and Villeneuve 2013; Teixeira and O'Brien 2017). In the international survey mentioned above (Ehrensberger-Dow et al. 2016), about three-quarters of the respondents reported that they used CAT tools and that they found them helpful at least some of the time, but most of them kept the default settings instead of customizing them to suit their needs. However, over half of those respondents said that they found certain things about their CAT tools problematic. A qualitative analysis of their responses indicated that the complexity of the user interface, segmentation, formatting issues, visual presentation, and bugs caused irritation (O'Brien et al. 2017). Since being irritated can affect negatively performance, improvements in the cognitive ergonomics of translator tools could contribute to better decision-making, creativity, and efficiency.

Cognitive ergonomics at the translation workplace encompasses much more than the interfaces and functionalities of CAT tools, however. Working conditions, time management, and stress can all be associated with disturbances to the translation process (cf. Hansen 2006) and/or cognitive flow (cf. Ehrensberger-Dow and O'Brien 2015). The suggestion has been made that some of the typing mistakes that translators make might indicate stress and cognitive effort (Muñoz 2009). Such mistakes also present an additional cognitive load: backspacing to correct them interrupts writing flow, ignoring them transfers quality control to a later stage of the process, and auto-correct features of editing software can introduce new errors that need to be remedied.

If the ergonomic conditions are not optimal, it might be very difficult for translators to perform their screen-intensive tasks at the quality that is expected of them. As outlined in the previous section, working conditions can be related to the physical ergonomics of the office, furniture and equipment they are using, but translators are also part of a complex network (cf. Risku 2014). Unwanted distractions from others, whether within or outside their network, can detrimentally affect concentration and thus are also related to cognitive ergonomics (cf. Baethge and Rigotti 2010). More of the commercial



and institutional translators in the international survey reported in Ehrensberger-Dow et al. (2016) reported being disturbed by colleagues moving around and ambient noise than freelancers did, who tended to work alone, but a large majority of all three groups reported being disturbed by emails, chats, and phone calls. Reducing or eliminating such distractions would improve the cognitive ergonomics for the translators concerned by optimizing the organizational ergonomics of their workflow.

3.3. The organizational ergonomics of translation

The recent rapid developments in CAT tools and increasingly usable MT output have led to higher organizational expectations with regard to productivity and consequently additional time pressure. Advances such as neural machine translation (NMT) being integrated into TM systems are blurring the boundaries between human translation and post-editing of MT output. In most of the systems currently deployed, the origin of the suggested segment is marked as MT or TM, which may help the translators in their decision-making as to whether to accept the suggestion or not but also contributes to cognitive load. The quality of the MT suggestions is highly dependent on the programming effort that has gone into the development and tuning of the system, which is an organizational matter that is usually beyond individual translators' control. In a focus group study carried out at the European Commission's Directorate-General for Translation, reasons given for not using MT included fear of its influence on translators' performance as well as general discomfort with the technology (Cadwell et al. 2016). Policies and training with respect to working optimally with TM and MT as well as meeting clients' demands regarding quality, pricing, and deadlines need to be reviewed regularly and aligned with teams' expectations, expertise, software, and equipment.

As discussed above, the situated activity of translation involves not only physical and cognitive aspects of the workplace but also organizational factors. The freelancers who responded to the international survey seem more isolated than the commercial and institutional translators with respect to additional resources and style guides provided by the client (Ehrensberger-Dow et al. 2016). The trade-off of relative isolation is that freelancers have autonomy with respect to where, when, and how often they work; which jobs they do and in which order; and when they take their breaks. Commercial and institutional translators enjoy less self-determination over their workload and workflow, but they have more opportunities to discuss translation problems with colleagues, receive feedback, and have better support for their infrastructure and workflow. They may feel under pressure by the presence or expectations of others in their organizations, though, since they take significantly fewer breaks than freelancers do. Being under self-imposed or organizational pressure to spend extended periods engaged in very similar activities can be taxing, as translators struggle to maintain a high enough level of concentration to ensure quality.



4. Implications of an ergonomic perspective for translation

By adopting an ergonomic perspective on translation as an activity embedded in a variety of technological and organizational environments, we can shed more light on the interplay between the cognitive and situational aspects of the work done by translators. From an ergonomic perspective, it is the humans in the translation process as well as their interactions with each other and other elements in the system that are of interest (e.g. O'Brien 2012; Olohan 2011; Risku 2014) rather than their tools in isolation or the products of their processes. Translators operate within a network of mutually interdependent 'actors and factors' that can range from the micro level of irritating or missing features in the language tools that they have to use to the macro level of the societal status of machine versus human translation. Poor physical and cognitive ergonomics in translation may be compounded by organizational issues such as time pressure, inadequate feedback, and client-imposed tools (cf. Ehrensberger-Dow and Massey 2017). Although still relatively under-researched, the physical, cognitive, and organizational aspects of the translation workplace have come into focus for theoretical and practical reasons (see also Ehrensberger-Dow and Jääskeläinen 2019). Among other things, good ergonomic conditions should allow translators to make the cognitive effort required to evaluate risks and take appropriate decisions (cf. Canfora and Ottmann 2015; Pym 2015). A better understanding of how ergonomic conditions interact should also allow a better appreciation of the socio-technical issues that can impinge on professional practice.

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ЭРГОНОМИКА И ПРОЦЕСС ПЕРЕВОДА

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Процесс перевода включает множество действующих лиц и факторов, таких как организация работы, процесс коммуникации, управление переводческими проектами, безопасность на рабочем месте и статус переводчика. Физические факторы окружающей среды (например, освещение, температура, качество воздуха, организация пространства), а также роль переводчика и перевода для экономики и общества в целом могут оказывать влияние на процесс перевода. Изучение процесса перевода с эргономической точки зрения может обеспечить надлежащую основу для понимания характера и степени влияния вышеупомянутых факторов на эффективность сложной двуязычной деятельности переводчика. Поскольку процесс перевода требует особой концентрации внимания, переводчики вынужденно тратят энергию и, в конечном счете, когнитивные ресурсы на компенсацию отвлекающих моментов любого рода, начиная с ощущения физического дискомфорта и заканчивая недостаточной производительностью компьютера или проблемами организационного характера. В статье описываются результаты недавних исследований значения эргономики для процесса перевода и для переводчика.

Ключевые слова: процесс перевода, эргономика, профессиональные переводчики, рабочее место переводчика.

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