

# VU Research Portal

## The cognitive costs of managing emotions

Hofstee, Godelieve; Jansen, Paul; de Lange, Annet; Spisak, Brian; Swinkels, M.

### **published in**

Work and Stress  
2021

### **DOI (link to publisher)**

[10.1080/02678373.2020.1832608](https://doi.org/10.1080/02678373.2020.1832608)

### **document version**

Publisher's PDF, also known as Version of record

### **document license**

Article 25fa Dutch Copyright Act

[Link to publication in VU Research Portal](#)

### **citation for published version (APA)**

Hofstee, G., Jansen, P., de Lange, A., Spisak, B., & Swinkels, M. (2021). The cognitive costs of managing emotions: A systematic review of the impact of emotional requirements on cognitive performance. *Work and Stress*, 35(3), 301-326. <https://doi.org/10.1080/02678373.2020.1832608>

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

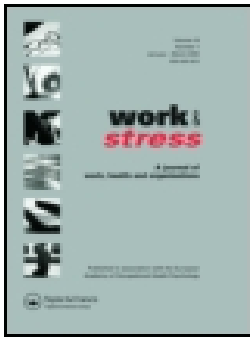
- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

### **Take down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

### **E-mail address:**

[vuresearchportal.ub@vu.nl](mailto:vuresearchportal.ub@vu.nl)



## Work & Stress

An International Journal of Work, Health & Organisations

ISSN: (Print) (Online) Journal homepage: <https://www.tandfonline.com/loi/twst20>

# The cognitive costs of managing emotions: A systematic review of the impact of emotional requirements on cognitive performance

Godelieve Hofstee , Paul G. W. Jansen , Annet H. De Lange , Brian R. Spisak & Maaïke Swinkels

To cite this article: Godelieve Hofstee , Paul G. W. Jansen , Annet H. De Lange , Brian R. Spisak & Maaïke Swinkels (2020): The cognitive costs of managing emotions: A systematic review of the impact of emotional requirements on cognitive performance, Work & Stress, DOI: [10.1080/02678373.2020.1832608](https://doi.org/10.1080/02678373.2020.1832608)

To link to this article: <https://doi.org/10.1080/02678373.2020.1832608>



Published online: 26 Oct 2020.



Submit your article to this journal [↗](#)



View related articles [↗](#)



View Crossmark data [↗](#)

REVIEW ARTICLE



# The cognitive costs of managing emotions: A systematic review of the impact of emotional requirements on cognitive performance

Godelieve Hofstee<sup>a,b</sup>, Paul G. W. Jansen<sup>a</sup>, Annet H. De Lange<sup>b,c,d,e,f</sup>, Brian R. Spisak<sup>g,h</sup> and Maaïke Swinkels<sup>b</sup>

<sup>a</sup>Department of Management & Organization, VU University Amsterdam, Amsterdam, The Netherlands; <sup>b</sup>School of Organisation and Development, HAN University of Applied Sciences, Nijmegen, The Netherlands; <sup>c</sup>Faculty of Psychology, Open University Heerlen, Heerlen, The Netherlands; <sup>d</sup>Norwegian School of Hotel Management, University of Stavanger, Stavanger, Norway; <sup>e</sup>Faculty of Psychology, Norwegian University of Science and Technology, Trondheim, Norway; <sup>f</sup>Department of Psychology, Universidad de Coruña, Coruña, Spain; <sup>g</sup>Department of Management, University of Otago, Otago, New Zealand; <sup>h</sup>National Preparedness Leadership Initiative, Harvard University, Cambridge, United States

## ABSTRACT

In our increasingly service-based world, employees are now, more than ever before, required to manage the emotional demands inherent to client interactions. These emotional demands can be fuelled by emotional display rules that are part of an organisational policy. However, what differentiates client interactions from other circumstances is that not only emotional performance standards should be met but also concurrent cognitive performance standards. In some professions, lives may even depend on the interplay between both kinds of performance. This systematic review is the first to offer a systematic synthesis of the surprisingly limited number of studies on this emotion–cognition relationship ( $N=18$ ). This synthesis clearly demonstrates that cognitive performance reduces when individuals are instructed to also modify their emotional expressions (expression focused emotion regulation) concurrently. However, although combinations of emotional and cognitive requirements most likely occur during professional events, only two studies used service simulations and none used real client interactions. Other outcomes of the systematic synthesis make it even more astonishing that the cognitive–emotional performance relationship has escaped the notice of the professional field. The most striking outcome is that emotion regulation is not only getting in the way of parallel but also of subsequent cognitive tasks.

## ARTICLE HISTORY

Received 20 March 2019  
Accepted 4 September 2020

## KEYWORDS

Emotion regulation; emotional labour; display rules; cognitive performance; cognitive functions

## Introduction

As the impact of the service industry has increased sharply in recent decades (Eichengreen & Gupta, 2013; World Bank Group, 2017), interactions with clients have become irreversible *moments of truth* in which organisations have to prove themselves (Normann, 1984). Consequently, client-oriented behaviour of front office employees,

including their emotional expressions, has increased substantially in importance (Peart et al., 2012; Rafaeli & Sutton, 1987). Emotional expressions constitute observable behavioural cues (i.e. facial, vocal and bodily) from which other individuals can deduce reactions and behavioural intentions towards situations (Mortillaro et al., 2013; Scherer, 2005). Emotional expressions can be felt or feigned (Ekman, 1984), and can be used to achieve effects in clients, such as influencing their emotions (e.g. using a gracious vocal expression to calm down clients) in the desired direction (Niven et al., 2009).

To ensure desirable emotional expressions on the part of employees, some service organisations have expanded their performance requirements with so-called emotional display rules at work (Diefendorff & Gosserand, 2003; Duffy et al., 2010). In other organisations, emotional display rules are unspoken; they are instead guided by organisation's mission statements, professional ethos or work-related norms (Diefendorff et al., 2006; Kinman, 2009; Zapf, 2002). Display rules formulate the organisation's expectations about the emotional expressions of their employees (Rafaeli & Sutton, 1987), and expect service employees to excel in emotional performance (Allen et al., 2010). For example, the most common emotional display rules demand service employees to produce neutral or positive emotional expressions (also labelled as "service with a smile"), even when they have negative feelings about the client they are helping (Grandey, 2003; Morris & Feldman, 1996).

When employees need to modify their emotional expression, this is established by means of emotion regulation. According to Gross (1999) emotion regulation involves all of the efforts to increase, maintain, or decrease one or more components of an emotion (i.e. emotional expressions, emotional experiences and physical emotional responses). Of the emotional components, emotional expressions are best observable. For the avoidance of doubt, in this review we do not regard visible physical responses (e.g. blushing, sweating) as emotional expressions.

At first glance, it seems self-evident that organisations expect their service employees to regulate the expression of emotions. Regulation of expressed emotions is even classified as an unskilled element of service delivery, which employees also apply in daily life (Gross et al., 2006) and from which they derive almost no extra status (Payne, 2009). In other words, it is not viewed as "strenuous work." However, given the mounting evidence that such enforced emotion regulation leads to a substantial number of well-being and employability problems with service staff, this perspective is no longer appropriate (for an overview, see Hülshager & Schewe, 2011). For example, recent research has shown that enforced emotion regulation plays a role in the development of a significant number of work-related problems, including burnout (e.g. Grandey et al., 2012; Lee et al., 2015; Prentice, 2013).

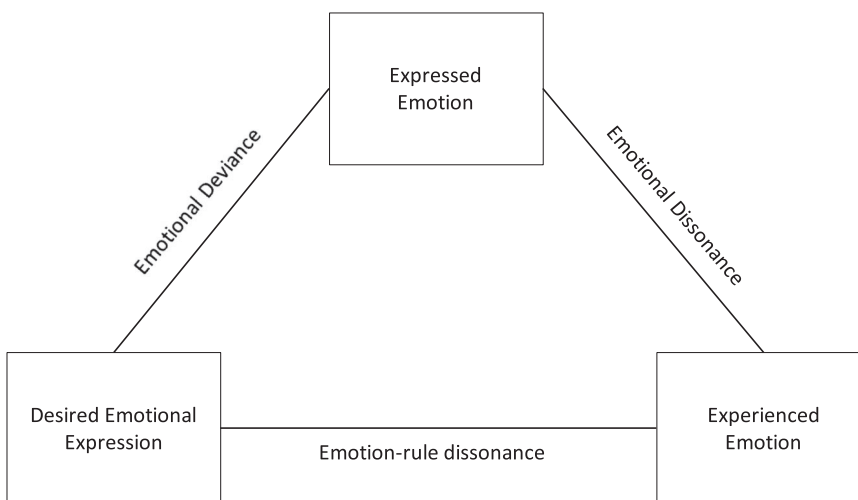
In an extension of these new insights about the consequences of enforced emotion regulation, Grandey et al. (2015) argue that emotional display rules should be abolished. The main argument behind their radical proposition is that these management instruments are harmful to employee wellbeing in the longer term. They also argue that the efforts to comply with emotional display rules deplete employees' cognitive resources, which subsequently threatens the proficient execution of short-term employee tasks (e.g. maintaining attention and decision making). Although experimental studies have already shown that requests to match emotional expressions with display rules have immediate disadvantages for cognitive performance (Richards & Gross, 1999),

Grandey et al. (2015) seem to be the first to recognise that this emotion–cognition interplay may cause substantial problems in service contexts, such as in hospitals, public transport, and the police force. They argue that emotional display rules, which were initially created as management instruments to improve service quality, can, in fact, be counterproductive (in both the short-term and long-term), and at the extreme endanger lives. Thus, combining cognitive and emotional performance standards has the potential for considerable negative outcomes in the service context. Nonetheless, there still is no overview of what we know about the cognitive-emotional performance interplay. As a result, managers and employees do not have enough leads to direct the emotion–cognition interplay during service interactions.

Accordingly, the current systematic review discusses to what extent there is evidence on the adverse effects of enforced emotion regulation on cognitive performance. Based on our findings we shall subsequently offer suggestions for future research. Before discussing our method and findings, we will begin by explaining the problems that are set in motion by emotional performance requirements and how these problems have been approached in earlier research.

### *The costs of emotional labour*

Emotional performance requirements are not challenging in themselves. However, these expectations are more difficult to address when they collide with the emotions employees experience at a given moment (Morris & Feldman, 1996; Rupp & Spencer, 2006; Schaubroeck & Jones, 2000; Sliter et al., 2010). We will further use the triangle model in Figure 1 to explain this problem. Misfits between desired emotional expressions and experienced emotions are named emotion-rule dissonance (Hochschild, 2003; Morris & Feldman, 1996; Rafaeli & Sutton, 1987). Due to the tendency of individuals to express emotions that are consistent with their feelings (Grandjean et al., 2008), emotion-rule dissonance may degenerate into incongruences between expressed emotions and



**Figure 1.** Triangle model of emotional labour.

desired emotional expressions. These incongruences are called emotional deviance (Thoits, 1990). To minimise the latter, employees can try to redirect processes that lead to emotional deviance. The effort, planning and control it requires employees to manage their expressed and experienced emotions in such circumstances, is denoted as emotional labour (Ashforth & Humphrey, 1993; Grandey, 2000; Morris & Feldman, 1996).

Two types of strategies can be used to diminish emotional deviance, namely “deep acting” versus “surface acting” (Grandey, 2003; Hochschild, 2003). When employees apply deep acting, they aim to reduce emotion-rule dissonance (see also Gross & Thompson, 2007). This type of emotional labour focusses on modifying the experienced emotion by reappraising the provoking elements in situations, such as feeling less negative through reasoning from the perspective of the client. By contrast, surface acting is a strategy that sustains emotion-rule dissonance, but tries to align expressed emotions with desired emotional expressions. This is achieved by hiding, amplifying or feigning the expression of emotions (see also Gross & Thompson, 2007). Accordingly, this type of emotional labour focusses on expressed emotions by means of inhibiting impulsive behaviour and role playing (e.g. hiding anger or pretending to be happy).

Earlier research has shown that emotional labour can be costly for employees, and, consequently, scientific interest in this issue has increased greatly (Nahrgang et al., 2011). A large number of studies have demonstrated that jobs requiring frequent emotional labour are related to a variety of problems that employees face over time. These problems include several mental and physical diseases (see, e.g. Ashforth & Humphrey, 1993; Näring et al., 2006; Zapf et al., 1999) and negative job attitudes (see, e.g. Grandey et al., 2012; Lewig & Dollard, 2003). This means that emotional performance requirements may promote service quality and may even be a rewarding and satisfactory aspect of service work (Humphrey et al., 2015; Mastracci et al., 2012), but can also cause significant harm in the long run through increased emotional labour.

### *Cognitive side effects of emotion regulation*

However, though these earlier studies were important in revealing that emotional labour also has a dark side, they did not capture the effects on cognitive performance. Additionally, these earlier studies did not focus on the direct depleting effects of emotional labour associated with specific client interactions. Because the studies have almost exclusively used longer assessment periods, emotional labour has predominantly been examined as a general working condition causing problems in employees (e.g. depression, burnout) that develop over time (Grandey et al., 2013). This means that the focus has been on *chronic* consequences following a large number of interactions, rather than on the *acute* risks for separate client encounters.

To overcome this shortcoming, the current review will incorporate evidence for the *immediate* cognitive resource depletion caused by deliberate emotion regulation. For this purpose, we will determine to what extent emotion regulation occupies cognitive resources that are also needed for concurrent cognitive tasks (see Baumeister et al., 1998). As a consequence, making greater efforts to execute activities that support emotion regulation (e.g. monitoring and correcting one’s actions) throughout an emotional event can lead to decreased performance in other areas (Gross, 2002).

An advantage of focusing our systematic review on resource depletion studies, is that these cognitive consequences of emotion regulation have been demonstrated predominantly in experiments. The event-oriented approach of experiments, ensures that causal relationship between emotion regulation and cognitive performance can be studied during distinct emotion-electing events (Morgeson et al., 2015). This makes it possible to determine how specific emotion regulation strategies deplete cognitive resources at specific stages of these events. These effects can be derived from dependent variables (e.g. response times, number of correct answers) that show to what extent cognitive information processing suffered from resource depletion or, put differently, to what extent the execution of cognitive tasks was disturbed by concurrent efforts to regulate emotions (see also Matthews et al., 2000). Additionally, these dependent variables reflect to what extent intra-personal cognitive functions (e.g. attention, memory and reasoning) were able to contribute to the execution of cognitive tasks.

The event-oriented approach also provides an opportunity to identify particular characteristics of emotion-electing events (e.g. angry clients) that make it more difficult to cope with combinations of demands on emotional expressions and additional cognitive performance requirements.

### *The current review*

Our systematic review (cf. Petticrew & Roberts, 2008) aims at examining the relationship between emotional and cognitive performance. This is necessary because knowledge is scattered over various research areas, such as social psychology (e.g. Johnson et al., 2010) occupational health psychology (e.g. Goldberg & Grandey, 2007) and cognitive psychology (e.g. Schmeichel, 2007). In addition, there are substantial differences between the research approaches used, such as variations in display rules and cognitive tasks. Accordingly, we obtained and synthesised the outcomes and characteristics of all studies in this area. We examined the following questions:

- (1) How many studies examined the relationship between emotion regulation and cognitive performance?
- (2) What is the general design of the included studies?
- (3) To what extent do the included studies show that emotion regulation has a negative impact on cognitive performance?
- (4) Which emotional display rules evoke emotion regulation strategies that are disadvantageous to cognitive performance?
- (5) Which cognitive functions suffer from disadvantageous emotion regulation strategies?
- (6) Which contextual factors worsen the disadvantageous cognitive effects of these strategies?
- (7) What are the methodological shortcomings in the set of studies in our review?

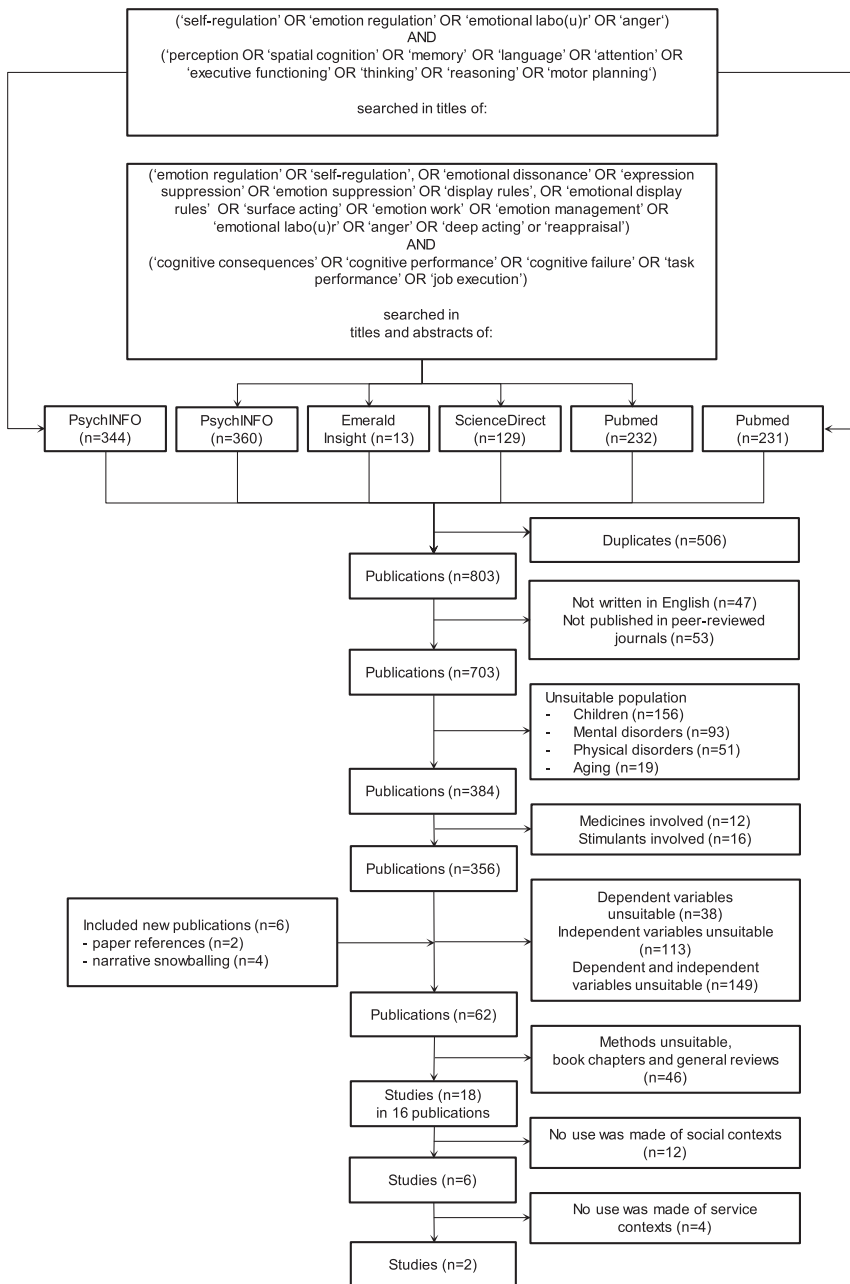
In the next sections, we describe the methodology we used, discuss the results and conclusions found, and present an agenda for future research.

## Method

To answer research question 1, we carried out a systematic search (Petticrew & Roberts, 2008) of earlier peer-reviewed empirical research on the effect of imposed emotion regulation on cognitive performance. In order to answer research question 2–7, we narratively synthesised the included studies (Petticrew & Roberts, 2008) by systematically describing and integrating the outcomes of these studies. In this section we will further describe the systematic search. We will first report the search strategies we used in order to obtain a large sample of studies. Secondly, we will describe the selection procedure and our inclusion and exclusion criteria for selecting studies appropriate for further analysis.

### *Search strategies and initial screening*

To obtain a sample of highly qualified studies, we applied two search strategies: electronic search and snowballing. The results of the snowballing process were added to the sample at a later stage. All steps of the systematic review are shown in [Figure 2](#). We first executed electronic searches in four databases: “Emerald Insight,” “Science Direct,” “PsycINFO,” and “Pubmed.” This search focused on all publications prior to January 2019. We searched for studies on the effects of imposed emotion regulation (which is the independent variable) on the execution of cognitive tasks (which is the dependent variable). For this purpose, we used multiple combinations of search terms. We divided these terms into two groups of keywords. Fourteen keywords represented emotion regulation. Five other keywords referred to cognitive performance. The keywords in the emotion regulation list were the following: “emotion regulation,” “self-regulation,” “emotional dissonance,” “expression suppression,” “emotion suppression,” “(emotional) display rules,” “surface acting,” “emotion work,” “emotion management,” “emotional labo(u)r,” “deep acting,” “reappraisal” and “anger.” The list of keywords representing cognitive performance consisted of the following: “cognitive consequences,” “cognitive performance,” “cognitive failure,” “task performance,” and “job execution.” Subsequently, during each search action, we combined one keyword from each list into two separate search fields. Consequently, we searched for 70 keyword combinations in the titles and abstracts of articles stored in the separate databases. We repeated this action until we had searched across every selected database with every possible keyword combination. This resulted in 280 search actions that provided us with a provisional sample of 734 article titles. In order to expand this sample, we executed a second series of searches. We applied the same method, except that we used the databases (i.e. PsycINFO, Pubmed) and “emotion regulation” keywords (i.e. self-regulation, emotion regulation, emotional labo(u)r, anger) that turned out to be the most adequate during the first series of searches. Furthermore, we now only searched the article titles (not the abstracts), and we combined the selection of “emotion regulation” keywords with a new group of keywords representing the general cognitive functions underlying cognitive performance: “perception,” “spatial cognition,” “memory,” “language,” “attention,” “executive functioning,” “thinking,” “reasoning” and “motor planning.” We searched for 36 extra keyword combinations stored in the two adequate databases. The 72 search actions generated an additional sample of 575 article titles. This additional sample brought the total number of article titles in our total sample to 1,309.



**Figure 2.** Flowchart of the systematic search.

The titles in the total sample overlapped each other to a large extent ( $n = 506$ ). After duplicates were removed, we scanned the titles to exclude papers that were not written in English ( $n = 47$ ) and that were not published in peer-reviewed journals ( $n = 53$ ). After this first tidying-up action the sample was reduced to 703 titles.

### **Main eligibility criteria**

In the next phase of our review, we evaluated the usability of the remaining 703 titles by screening their abstracts. We prepared a list of inclusion and exclusion criteria to select articles that suited our research questions and to reject articles that did not.

Our first group of exclusion criteria helped to rule out populations that did not adequately represent the working population. We excluded articles that focused on individuals with mental disorders or other abnormalities related to emotion regulation or impulse control, such as chronic anger, borderline personality, bipolar and attention deficit hyperactivity disorders ( $n = 93$ ). Additionally, we excluded articles in which individuals had physical disorders ( $n = 51$ ). We also excluded studies focusing on aspects of immaturity in children under the age of 18 ( $n = 156$ ) or on aging after retirement ( $n = 19$ ).

A second set of inclusion and exclusion criteria was used to exclude articles in which medicine ( $n = 12$ ) or stimulants played a role ( $n = 16$ ).

Finally, with a third series of criteria, we tried to ensure that the right combinations of independent and dependent variables were evaluated. Independent variables had to concern the imposed regulation of emotions that were evoked by external stimuli (e.g. indignation evoked by showing negative consequences of pollution on animals). One hundred thirteen articles were ultimately excluded because respondents were not expected to use emotion regulation strategies or because emotions were evoked by unpleasant internal sensations, such as hunger and pain. To ensure that the right dependent variables were used, it was essential that data about cognitive performance were available. A total of 38 articles were excluded because subjects who performed badly could not be distinguished from subjects who performed well (e.g. because tasks were only partially cognitive). A further 149 articles were also excluded because both the independent and the dependent variables did not match with the above methodological requirements.

### **Snowballing**

Parallel to the last stage of the systematic search process, we extended the electronic search by applying narrative snowballing techniques (Sayers, 2008). For this purpose, we carefully explored the texts and reference lists of the remaining articles. We then continued this process by scanning the new literature until we found no additional relevant studies. These actions resulted in six additional articles.

### **Hierarchy of evidence**

In this stage of the review, we individually scanned all studies that were described in the articles. When we started our review, we initially planned to exclude articles that did not involve service contexts. However, this criterion proved to be so strict that the body of evidence was reduced to an unacceptably low level of just two studies. Thus, to answer the research questions, we decided to also include articles in which subjects were operating in non-service situations. An important prerequisite was that the included articles

involved manipulations that strongly resembled emotional display rules employees are subjected to in business life (e.g. to suppress an inappropriate emotional expression). Four articles were excluded because they did not meet this criterion. In one of these articles, for example, subjects received overly detailed instructions about their emotional expressions (Peters et al., 2014).

At that point, sixteen articles remained in the review. Because seven of these publications reported on several appropriate and inappropriate studies, we decided to switch to describing studies instead of publications. In the end, only 18 studies remained. Subsequently, these studies were assigned to three different levels in a “hierarchy of relevance” by means of context criteria. The studies at the highest level of this hierarchy, used contexts in which it is most relevant to be exposed to emotional and cognitive performance standards. In the results section, the order of this hierarchy will be further clarified. The complete search approach is summarised in [Figure 2](#).

## Results

### *Descriptives of selected studies*

Approximately two thirds of the included articles ( $n = 11$ ) were published after 2005, of which six reported about studies ranked at the two highest positions in our hierarchy of relevance.

The majority of studies were executed in North America ( $n = 14$ ). Just four studies were carried out elsewhere: two studies in Germany (Perbandt, 2007; Rohrman et al., 2011), one in Israel (Roth et al., 2014), and one in China (Wang et al., 2014). Most participants were undergraduate students ( $n = 13$ ). Consequently, in all included studies, the average age of the participants was younger than 26. Six studies included only female participants.

### *Findings per research question*

First, we will report on the quantity of evidence for the cognitive disadvantages of emotion regulation in service and non-service contexts. Next, we will describe the general design of the included studies. Third, we will discuss the extent to which we could determine whether emotion regulation negatively influenced cognitive performance. Fourth, we will take a closer look at the characteristics of those emotional display rules that were used to trigger emotion regulation. Fifth, we will evaluate the cognitive functions that are affected by emotion regulation. Sixth, we discuss the contextual factors that worsen the effect of these display rules. To conclude this section, we will highlight the methodological shortcomings that emerged during the review. The majority of the data of the systematic examination are summarised in [Tables 1](#) and [2](#).

### *Prevalence and type of evidence*

The first aim of this systematic review was to establish the prevalence of (experimental) studies examining the direct effect of emotion regulation on the execution of cognitive tasks.

**Table 1.** Overview of the contexts and display rules of the 18 included studies.

Reference	Target of ER/EL	Description emotion evoking stimuli	General Context	Description Context	Instruction per Condition
Rohrman et al. (2011)	A1	Bogus female customer making complaints	B1	Receiving a call in a simulated call centre	Condition 1: C9 Condition 2: C4
Goldberg and Grandey (2007)	A1	Customer requesting information about items not on sale	B1	Receiving a call in a simulated call centre	Condition 1: C9 Condition 2: C4
Richards et al. (2003)	A2	Issue on which the romantic partner of the subject disagreed about	B2	Discussion with romantic partner in a psychology lab	Condition 1: C0 Condition 2: C1 Condition 3: G6
Johnson et al. (2010)	A2	Another male participant who actually was a confederate making sexism-related remarks (discriminatory)	B2	Interaction with other participant in a psychology lab	Condition 1: C9 Condition 2: G1
Perbandt (2007)	A2	Unfriendly experimenter who also made participants wait while simulating private phone call	B2	Interaction with the experimenter in a psychology lab	Condition 1: C2 Condition 1: G8
Pearson et al. (2013)	A2	Having to behave opposite to one's beliefs during an interaction with a black female confederate whose responses were scripted and standardised	B2	Interaction with other participant in a psychology lab	Condition 1: C1 Condition 2: C10
Richards and Gross (2000), Study 1	A3	Negative emotion evoking film clip in which a husband makes a confession about an affair to his heartbroken wife, witnessed by their young child	B3	Psychology Lab	Condition 1: C0 Condition 2: C3
Schmeichel (2007), Study 4	A3	Disgust eliciting film clip reporting about eye surgery	B3	Psychology Lab	Condition 1: C0 Condition 2: C5
Richards and Gross (1999), study 1	A3	Information and photographs of people injured by accidents	B3	Psychology Lab	Condition 1: C0 Condition 2: C3
Richards and Gross (1999), study 2	A3	Information and photographs of people injured by accidents	B3	Psychology Lab	Condition 1: C0 Condition 2: C3
Vohs and Schmeichel (2003), study 1	A3	Sadness evoking fragment(s) from "Terms of Endearment"	B3	Psychology Lab	Condition 1: C9 Condition 2: C2 Condition 3: C5
Vohs and Schmeichel (2003), study 2	A3	Emotion evoking fragment(s) from "Mondo Cane" showing the negative consequences of pollution on animals	B3	Psychology Lab	Condition 1: C9 Condition 2: C3 Condition 3: C7
Baumeister et al. (1998), study 3	A3	Humor, sadness and stress eliciting videotapes	B3	Psychology Lab	Condition 1: C9 Condition 2: C3
Roth et al. (2014), study 2	A3	Fear-eliciting fragment(s) from "Silence of the Lambs"	B3	Psychology Lab	Condition 1: C0 Condition 2: C1 Condition 3: C11
Wang and Yang (2014)	A3	Sadness eliciting fragment(s) from "The Champ"	B3	Psychology Lab	Condition 1: C0 Condition 2: C3
Beatty et al. (2014)	A3	Embarrassing and unpleasant arousal eliciting photographs	B3	Psychology Lab	Condition 1: C0 Condition 2: C1 Condition 3: C9 Condition 4: C12

*(Continued)*

**Table 1.** Continued.

Reference	Target of ER/EL	Description emotion evoking stimuli	General Context	Description Context	Instruction per Condition
Dillon et al. (2007), study 2	A3	Negative arousal eliciting pictures	B3	Psychology Lab	Condition 1: C3 Condition 2: C9 Condition 3: C14
Hayes et al. (2010)	A3	Negative arousal eliciting pictures	B3	Psychology Lab	Condition 1: C3 Condition 3: C4 Condition 4: C9 Condition 4: C13
A1 = actor playing a client	B1 = service encounter		C0 = no instruction		C9 = to act naturally/authentic
A2 = random individual	B2 = non-service social interaction		C1 = to hide negative emotions		C10 = to hide positive emotions
A3 = no other individual present	B3 = watching visual materials alone		C2 = to display a neutral expression		C11 = to be attentive to their own emotion
			C3 = to hide any emotion		C12 = to deploy their attention from the stimulus by counting backwards
			C4 = To display a positive expression		C13 = to adopt the role of an independent observer
			C5 = to exaggerate any emotional expression		C14 = to empathise with figures in the pictures and amplify any emotion
			C6 = to adopt a positive attitude		
			C7 = to adopt an objective and analytical attitude		
			C8 = to display a negative expression		

Looking at codes A1 to A3 in the second and B1 to B3 in the fourth column of Table 1, it is first and foremost noteworthy that hardly any studies have focused on the effects of emotion regulation on task performance during service interactions (B1) with either real or actors playing clients (A1). Though it is the most relevant context in which combinations of emotional and cognitive performance standards appear, none of the studies investigated real service encounters and only two studies explored lab-based service simulations (Goldberg & Grandey, 2007; Rohrmann et al., 2011). All subjects in those studies were students playing the roles of service employees in simulated service encounters. Because these two simulations came closest to real service encounters, we regard them as highest in the hierarchy of relevance of our sample of studies, and consequently, we placed them in the upper two rows of Table 1.

To lend force to this limited evidence, we decided to obtain additional evidence from 16 laboratory experiments. In these experiments instructions to apply emotion regulation resembled display rules in real service interactions (see column 6). In only four of these 16 experiments, which are displayed in the next four rows, these instructions were intended to govern interactions with other individuals (A2). However, these individuals were not clients but rather various other types of conversation partners, such as romantic partners (Richards et al., 2003) or – supposedly – other subjects participating in the same experiment (Pearson et al., 2013).

The remaining ten experiments were lowest in the hierarchy of relevance because they did not involve social interactions (A3). In this category, subjects were instructed to modify their emotional responses to visual materials or information (see column 3), which varied from sadness-eliciting movie clips (e.g. Wang et al., 2014) to disgust-evoking medical pictures (e.g. Richards & Gross, 1999). In most of these experiments,

**Table 2.** Overview of the results of the 18 included studies.

Reference	Description cognitive task	Underlying cognitive functions	Timing cognitive task	Effect sizes
Rohrman et al. (2011)	Verbal fluency of the participants judged by observers, such as breaks and slips of tongue (job performance)	D1, D2, D3, D5, D6	E1	$C9 > C4$ , $F(1, 80) = 18.98$ , $p < .01$ , $\eta^2 = .08$
Goldberg and Grandey (2007)	Extent to which participants were able to record information and make calculations (job performance)	D1, D2, D3, D4, D5, D6, D7	E1	$C9 > C4$ , $F(1, 82) = 8.92$ , $p < .01$ , $\eta^2 = .10$
Richards et al. (2003)	Extent to which participants were able to recall what was said during the conversation	D1, D2, D3, D5	E3	$C6 > C1$ , $t(166) = 2.56$ , $p = .01$ , $d = .59$ No significant differences between $C6$ & $C0$ , and $C1$ & $C0$
Johnson et al. (2010)	Performance on a Stroop task	D2, D3, D4, D5, D6, D7	E2	Men: $C9 > C1$ , $F(1, 42) = 5.10$ , $p = .029$ , $\eta^2 = .11$ Women: $C9 = C1$ , $F(1, 42) = 1.53$ , $p = .22$ , $\eta^2 = .04$
Perbandt (2007)	Total recall of anagram solution in two trials	D1, D2, D3, D4, D5, D6, D7	E2	When subjects were not provoked: $C2 > C8$ , $F(1, 49) = 4.23$ , $p = .05$ , $d = .75$ When subjects were provoked: $C2 = C8$
Pearson et al. (2013)	Performance on a Stroop task	D1, D2, D3, D4, D5, D6, D7	E2	High pro-White Bias respondents: $C10 > C1$ , $t(64) = 2.88$ , $p < .005$ , $d = .72$ Low pro-White Bias respondents: $C1 > C10$ , $t(64) = -2.03$ , $p < .05$ , $d = -.51$
Richards and Gross (2000), Study 1	The extent to which participants were able to recall visual and auditory detail information of the film clip	D1, D2, D3, D5, D7	E3	$C0 > C3$ , $F(1, 51) = 8.89$ , $p = .004$
Schmeichel (2007), Study 4	The extent to which participants were able to remember sets of words while having to combine this with math tasks (operation span)	D1, D2, D3, D4, D5, D6, D7	E3	Sets recalled: $C0 > C5$ , $t(63) = 3.18$ , $p = .002$ , $d = 0.79$ Longest set: $C0 > C5$ , $t(63) = 2.03$ , $p = .046$ , $d = .51$ Words in correct sets: $C0 > C5$ , $t(63) = 3.16$ , $p = .002$ , $d = .78$ $C0 = C5$ Total recall: $C0 = C5$ , $t < 1$ , $d = .04$
Richards and Gross (1999), study 1	Performance on a memory task (recall and recognition)	D1, D2, D3, D5, D7	E3	$C0 > C3$ Recall: $F(1, 56) = 9.2$ , $p = .004$ $C0 > C3$ Recognition: $F(1, 56) = 4.4$ , $p = .04$

(Continued)

**Table 2.** Continued.

Reference	Description cognitive task	Underlying cognitive functions	Timing cognitive task	Effect sizes
Richards and Gross (1999), study 2	Performance on a memory task (recall and recognition)	D1, D2, D3, D5, D7	E3	C0 > C3 Recall: $F(1, 83) = 4.71, p = .03$ Recognition: $F(1, 83) = 6.0, p = .01$
Vohs and Schmeichel (2003), study 1	Rating the length of a film clip	D1, D2, D3, D7	E3	C9 > C2 $t(38) = 1.91, p = .06, d = .62$ C9 > C5 $t(38) = 3.27, p < .01, d = .44$
Vohs and Schmeichel (2003), study 2	Rating the length of a film clip	D1, D2, D3, D7	E3	C9 > C3 $t(48) = 3.13, p < .01, d = .90$ C7 > C3 $t(48) = 3.63, p < .05, d = 1.05$
Baumeister et al. (1998), study 3	Performance on an anagram task	D1, D2, D3, D4 (if the unscramble was a mental task), D5, D7	E2	C9 > C3 $t(28) = 2.12, p < .05, d = .80$
Roth et al. (2014), study 2	The extent to which participants were able to recall details from the film clip	D1, D2, D3, D5, D7	E3	C11 > C0 > C1 $F(2, 113) = 2.50, p < .08, \eta^2 = .05$ C11 > C1 $t(114) = 2.15, p < .05$
Wang and Yang (2014)	Reaction time and performance accuracy on incongruent versus congruent trials in a Stroop task	D1, D2, D3, D4, D5, D7, D8	E2	Interaction between trial (congruent or incongruent) & instruction type: C0 > C3 $F(2, 44) = 3.849, p = .029, \eta^2 = .149$
Beatty et al. (2014)	d2 task of attention	D1, D2, D3, D6, D7	E2	C0 > C1 > C9 > C12 $F(2.340, 74.873) = 5.193, p = .0002, \eta^2 = .140$
Dillon et al. (2007), study 2	The extent to which participants were able to recall unpleasant pictures from specific trials and to write down as many detailed descriptions as possible of these pictures	D1, D2, D3, D5, D7	E3	C14 > C9 > C3 $F(1, 35) = 86.27, p = .0001, \eta^2 = .71$
Hayes et al. (2010)	The extent to which participants were able to recognise 160 pictures between 100 novel pictures 2 weeks after the experiment.	D1, D2, D3, D5, D7	E1	C13 > C9 > C3 > C4 $F(3, 72) = 3.09, p < 0.05$

<p>D1 = memory D2 = attention &amp; executive functioning D3 = perception D4 = spatial cognition D5 = language D6 = motor skills D7 = thinking an reasoning</p>	<p>E1 = simultaneously E2 = subsequently E3 = simultaneously and subsequently</p>	<p>C0 = no instruction C1 = to hide negative emotions C2 = to display a neutral expression C3 = to hide any emotion C4 = To display a positive expression C5 = to exaggerate any emotional expression C6 = to adopt a positive attitude C7 = to adopt an objective and analytical attitude</p>	<p>C8 = to display a negative expression C9 = to act naturally/ authentic C10 = to hide positive emotions C11 = to be attentive to their own emotion C12 = to deploy their attention from the stimulus by counting backwards</p>
---	---	--	--

(Continued)

**Table 2.** Continued.

Reference	Description cognitive task	Underlying cognitive functions	Timing cognitive task	Effect sizes
				<i>C13 = to adopt the role of an independent observer</i>
				<i>C14 = to empathise with figures in the pictures and amplify any emotion</i>

subjects were told that the experimenter was observing them during task execution. These twelve additional studies bring the number of studies included in our sample to the total of 18 mentioned above.

### General design

The second objective of conducting a systematic review was to synthesise the general design of the existing studies. All these studies are experiments, correlational studies in real contexts are missing. In all of the existing studies, instructions to regulate emotions were the independent variables that were supposed to have different effects on cognitive task performance. The need to align with display rules (e.g. reports of mismatches between required and felt emotions) or self-reports of the usage of emotion regulation strategies were not measured.

In the sixth column of [Table 1](#), we categorised these instructions in 15 categories of manipulations by means of the codes C0 to C14. The explanations of these codes are listed beneath [Table 1](#). A closer examination of the sixth column shows that in all cases the effects of various types of emotional display rules were compared with each other. The majority of studies had control conditions, in which emotional display rules were absent (C0) or in which subjects were invited “to act naturally” (C9). In the emotion regulation conditions subjects were not allowed to show their true emotions by means of instructions such as “to hide negative emotions” (C1) or “to adopt a neutral expression” (C2). Surprisingly, the instruction “to display a positive expression” (C4) was used in just two service simulations (Goldberg & Grandey, 2007; Rohrman et al., 2011). These were, in fact, call centre simulations, which implies that only the auditory representation of “service with a smile” received attention in our sample of studies (i.e. none of the studies in our sample investigated face-to-face emotional display rules associated with forced positive expressions). A few studies used instructions to adopt a neutral (C7; e.g. Wang et al., 2014) or a positive attitude (C6; e.g. Vohs & Schmeichel, 2003), or to play the role of an independent observer (C13; e.g. Dillon et al., 2007). These instructions can be considered as invitations to apply reappraisal or deep acting strategies, but not as display rules. In order to compare them with display rules, we nevertheless included them in [Table 1](#).

Cognitive performance was the dependent variable, which was influenced by concurrent emotion regulation tasks. In the 18 studies eligible for review, cognitive performance was judged by means of very divergent tasks, such as recalling information (Richards et al., 2003), verbal fluency (Rohrman et al., 2011), and processing speed (Wang &

Yang, 2014). More details about the cognitive tasks can be examined in column two of Table 2. In order to better compare the tasks, we made an additional overview of the underlying cognitive functions. By means of double blind coding, we assigned one or more of the following seven cognitive functions to each task: perception, spatial cognition (e.g. mental rotation), memory, language, attention & executive functioning, thinking & reasoning, and motor planning. We listed the underlying cognitive functions in the third column of Table 2 using the codes D1 to D7. The codes are explained at the bottom part of the table. The majority of the cognitive tasks required memory ( $n = 17$ ), attention & executive functioning ( $n = 18$ ), perception ( $n = 18$ ), thinking & reasoning ( $n = 16$ ) and language ( $n = 15$ ). Less tasks required spatial cognition ( $n = 7$ ) and motor planning ( $n = 8$ ).

Finally, it is important to note that the timing of the cognitive tasks within the research procedures varied among the studies in our sample. Column four in Table 2 shows that the cognitive tasks could be planned parallel to the emotion regulation tasks (E1), but also after the emotional event (E2). Half of the studies used a combination of parallel and successive tasks (E3).

### *Evidence of the cognitive side effects of emotion regulation*

A third aim of this review was to determine the extent to which the included studies show that emotion regulation has a negative impact on cognitive tasks (in service contexts and in non-service contexts). Due to a great variability in interventions settings, outcomes and study design, in combination with a limited number of studies, it was not possible to perform a meta-analysis (Petticrew & Roberts, 2008). Nevertheless, separate outcomes of the studies in column five in Table 2 clearly show that service organisations are taking more risks when they expect their employees to feign emotions than if they do not formulate such requirements. This was first noted by the two studies highest in the hierarchy of relevance (Goldberg & Grandey, 2007; Rohrmann et al., 2011). Specifically, these studies revealed that during service simulations, subjects performed significantly ( $p < .01$ ) worse on cognitive tasks when they were instructed to “act friendly” towards difficult clients than when instructed to “act naturally.”

Secondly, moderate negative effects of emotion regulation were also found one step lower in the hierarchy of relevance (Johnson et al., 2010; Pearson et al., 2013; Perbandt, 2007; Richards et al., 2003). It concerned four experiments with non-service interactions. In these interactions, emotional performance was relevant because it could contribute to the quality of the relationship with the other person, while cognitive performance had no purpose. Subjects were brought into uncomfortable social situations, such as interactions with another male participant who made sexist remarks but who was actually a confederate (Johnson et al., 2010) or an unfriendly experimenter (Perbandt, 2007). It appears that instructions that force subjects to modify their emotions are more disadvantageous for cognitive performance compared with instructions of a different nature. For example, subjects with a bias against African-Americans had more problems with subsequent cognitive tasks when they were forced to hide their negative emotions towards an African-American member of the research team than when they had to hide positive emotions. The opposite effect was found in subjects with no bias against African-Americans (i.e. they had more cognitive problems after hiding positive emotions; Pearson et al., 2013).

Finally, we also looked at the experiments in which the abovementioned effects were investigated while the subjects were the only individuals present. This means that subjects did not have to monitor the behaviour of individuals they were interacting with. Instead, subjects were exposed to emotion-evoking materials, which were movie clips ( $n = 7$ ) or pictures ( $n = 5$ ). Despite these unnatural conditions, the majority of the non-social experiments demonstrated that subjects had more cognitive difficulties when they were instructed to modify their emotional expressions, compared to conditions in which instructions were omitted or in which subjects were instructed to act naturally. In the remaining two non-social experiments, subjects had to exaggerate their emotions in the “emotion regulation” condition. Moderate disadvantageous effects were found when subjects had to exaggerate sadness (Vohs & Schmeichel, 2003), while large disadvantageous effects appeared when they had to exaggerate disgust (Schmeichel, 2007).

### *Emotional display rules that are disadvantageous*

A fourth aim of our systematic review was to investigate which characteristics of emotional display rules trigger emotion regulation strategies that impair the execution of cognitive tasks. Though the sample of included studies was fairly small, we can establish three interesting points.

Firstly, our review shows that subjects had more problems with cognitive tasks when they were instructed to apply surface acting strategies than when they were instructed to react authentically or when they got no instructions. The applied surface acting strategies included faking emotions (e.g. to exaggerate emotional expressions) and hiding emotions (e.g. to avoid showing anger). However, because none of the 18 studies combined different surface acting strategies in the same study, it is not possible to compare the effects of these strategies on cognitive performance.

Secondly, our review supports the event-oriented approach (Morgeson et al., 2015), that is characteristics of the specific situation determine the extent to which emotional display rules lead to decreased performance. For instance, instructions to express authentic feelings about visual materials worked better when subjects were exposed to humorous pictures (Baumeister et al., 1998) than when they were exposed to erotic pictures (Beatty et al., 2014). Similarly, instructions to put on an angry face worked better when subjects were treated badly by the experimenter than when they were treated in a friendly manner (Perbandt, 2007). Translated into service circumstances, not only emotional display rules but also the course of the interactions with clients would determine the extent to which a service encounter is emotionally demanding. This would put even more pressure on employees who have to excel in emotional performance, and increases the responsibility of companies to manage this problem.

Finally, reappraisal strategies appear to be more favourable for cognitive performance than strategies to modify emotional expressions. This was demonstrated in three studies, in which subjects received different reappraisal instructions: to adopt an objective and analytical attitude (Vohs & Schmeichel, 2003), to make the information not relevant for themselves or loved ones (Hayes et al., 2010), and to interpret the conversation in a positive light (Richards et al., 2003). In these three studies, cognitive performance concerned recalling information to which subjects were exposed during the emotion regulation task.

### *Cognitive functions that suffer from emotion regulation*

The fifth purpose of this systematic review was to evaluate which cognitive functions are associated with the cognitive tasks that suffered from expression focussed emotion regulation. These functions were assigned to the cognitive tasks by means of double blind coding.

The third column of [Table 2](#) shows the combinations of functions the performance levels of the cognitive tasks depended on. It is worth noting that in all 18 studies each performance level relied on at least four functions. In one-third of the studies, performance levels even depended on no less than seven cognitive functions. In all studies the cognitive tasks needed the functions attention and perception. In most studies memory ( $n = 17$ ), and reasoning & thinking ( $n = 16$ ) were also needed. Without exception, disturbances in these four most common functions can be considered as risky when they occur during real service encounters (e.g. problems with recalling client information or overlooking important details of clients).

Additionally, column 4 in [Table 2](#) shows that the reduced availability of cognitive functions can maintain until after the emotion regulation task. Thus besides that three studies demonstrated that deteriorated cognitive performance occurs parallel to emotion regulation tasks (e.g. Wang & Yang, 2014), nine other studies (E3) uncovered that subjects had problems recalling information afterwards (e.g. Richards & Gross, 1999). This entailed a combination of parallel and subsequent problems. This means that in the context of service delivery employees might have trouble to complete cognitive tasks after emotionally demanding client interactions. The remaining six studies (E2) showed that subjects also have problems with new cognitive tasks to which they were exposed after the emotion-electing events (e.g. Roth et al., 2014). Thus, viewed from the perspective of service organisations, employees might underperform during interactions with the next client.

### *Contextual factors*

A sixth objective of conducting this review was to identify contextual factors that increase the disadvantageous effects of emotional display rules. These factors are outlined in the second column of [Table 3](#). The third column demonstrates the way in which performance on cognitive tasks declines as a result of exposure to specific emotional display rules. Subsequently, the significance levels and effect sizes are shown in the fourth column. The table shows that 4 of the 6 different contextual factors that have been examined worsen the effect of emotional display rules. Three of these 4 factors are person-related factors. It has been apparent for some time that certain person-related characteristics may determine the extent to which individuals perceive situations as threatening (e.g. Siemer et al., 2007) or have the ability to regulate their emotions (e.g. Mayer & Salovey, 1997). Examples of person-related factors that lowered cognitive performance in our sample were a lack of experience with sexism (Johnson et al., 2010) and a pro-white bias (Pearson et al., 2013). In service contexts, this means that the extent to which cognitive performance is affected by specific emotional display rules will vary over individuals, and so will service quality.

Despite these differences among individuals, situational factors may also intervene on the relationship between emotional and cognitive performance. In all experiments subjects were exposed to stimuli that evoked feelings that had to be regulated subsequently. However, there was only one study in our sample (Goldberg & Grandey, 2007) in which

**Table 3.** Overview of factors that worsen the side-effects of display rules.

Reference	Factor	General effect	Effect sizes
Rohrmann et al. (2011)	Trait anger	Not a significant interaction	Not a significant interaction
Goldberg and Grandey (2007)	Customer hostility	G4 condition Polite > Hostile customer	$F(1, 82) = 8.92, p < .01, \eta^2 = .10$
Johnson et al. (2010)	Lack of experience with sexism	G1 condition women > men	$F(1, 42) = 5.47, p = .024, \eta^2 = .12$
Perbandt (2007)	Low extraverted	H3 condition high extraverted > low extraverted	$F(1, 45) = 3.23, p = .08$
Pearson et al. (2013)	Pro-White Bias	G4 condition low pro-white > high pro-white G8 condition high pro-white > low pro-white	
Schmeichel (2007) Study 4	Mood and arousal	Not a significant interaction  <i>G1 = to hide negative emotions</i> <i>G4 = To display a positive expression</i> <i>G8 = to display a negative expression</i>	Not a significant interaction  <i>H3 = provoking interaction</i>

provoking situations were compared with non-provoking situations. The study shows that customer hostility worsened the adverse effects of emotional display rules on cognitive performance (i.e. making calculations).

### *Methodological shortcomings*

Finally, we examined the methodological shortcomings of the included studies. The main shortcoming is that the intrapersonal processes that occur between subjects' exposure to emotional display rules and those subjects' consequent cognitive problems have been completely ignored. This means that the intrapersonal perception and management of misfits between experienced emotions, and expected and expressed emotional expressions have not been examined. As a result, it is not possible to establish how these processes relate to the execution of concurrent cognitive tasks.

Another methodological shortcoming concerns the manipulation checks, which can verify if subjects complied with the emotional display rules concerned. The majority of studies did not include such manipulations checks. Only a few studies tried to achieve this by having the emotional expressions of the subjects judged by collaborators. We argue that it would have been better to use objective methods, such as emotion recognition hardware and software, to judge the quality of the emotional responses of the subjects (Zeng et al., 2009).

A third inadequacy is that in the reappraisal conditions, subjects were asked to interpret emotion evoking visual materials differently. To comply with this request, subjects had to look closely to these materials. In the suppression conditions, however, subjects were instructed to focus on their *own* emotional expressions. Consequently, differences in the ability to recall information may have been caused by the different focus of the subjects instead of resource depletion. It would have been preferable to use cognitive tasks that were not related to information that was shown during the emotion evoking events.

## General discussion

To determine whether emotional performance standards endanger service quality, this systematic review gathered and evaluated all existing empirical studies concerning the immediate effects of emotion regulation on cognitive performance ( $N = 18$ ). Regarding the seriousness of the problem, this is a surprisingly small number of studies.

The original sample included just two studies conducted in simulated service contexts (and none in real service settings), even though these are the contexts in which this relationship is most relevant. Nevertheless, to obtain more insight into the side effects of the emotional demands that can be expected in service contexts, we also included an additional sixteen studies conducted in non-service contexts.

All eighteen studies in our sample demonstrate that emotional display rules that promote expression focused emotion regulation (i.e. surface acting in service contexts) during emotion evoking moments, are getting in the way of both parallel and subsequent cognitive tasks. Notwithstanding the methodological heterogeneity of these studies, the adverse consequences of these display rules remained firm. For instance, the effect remained uncontested regardless of the type of provoking stimulus to which the subjects were exposed (e.g. unfriendly experimenter who also made participants wait). The effect also persisted regardless of the strictness of the emotional display rules (e.g. to avoid showing any negative emotions). Together with existing knowledge about the long-term well-being risks that emotional labour imposes on employees (Hülshager & Schewe, 2011), our findings illustrate that service organisations should be cautious with interventions intended to artificially optimise emotional expressions of employees.

An additional objective of our systematic review was to identify contextual factors that worsen the disturbing effect of emotional display rules on cognitive performance (e.g. customer hostility). In accordance with earlier findings (Mauss et al., 2007), our review suggests that traits (i.e. extraversion) play a role. This means in practice that knowledge about these traits can help managers in the service sector organise work in a way that optimises both emotional and cognitive performance. However, much detailed knowledge is still required to achieve this.

## Limitations and improvements

Despite the fact that each study in our review individually supported the assumption that enforced emotion regulation can result in reduced cognitive performance, the studies in our sample lacked a common approach. We will discuss three important examples of these overarching validity problems. Additionally, we will make corresponding recommendations for both applied and experimental research.

First, we noticed that different emotional display rules were used for the same purpose. This problem primarily applied in suppression and control conditions. For instance, in suppression conditions, rules that requested that subjects “hide negative” or “display neutral” emotions were treated as interchangeable, even though they may have triggered different emotion regulation strategies. “Hiding negative emotions” involves behavioural inhibition (Gross, 1999), while, on the other hand, producing “neutral emotional expressions” involves showing a desired emotional expression (Grandey, 2000). In

control conditions, we encountered similar differences in approach. For example, some studies operationalised control conditions by giving no instructions, while other studies concretised the control condition by inviting subjects to act naturally. When given no instructions, certain individuals create their own emotional display rules (e.g. Morgan & Krone, 2001). Though individual studies should not be criticised for choosing divergent formulations, this entire area of research would benefit from using general directives that define how to formulate the main instructions. Moreover, general standards would better facilitate managers to select just the right formulations of emotional display rules.

A second validity issue occurs because studies in our sample did not distinguish between cognitive tasks that were planned parallel and tasks that were planned subsequently to the emotion regulation task. Problems with parallel cognitive tasks may have been caused by cognitive capacity problems in working memory that occur when the number of cognitive tasks – including emotion regulation – becomes too high (Schmeichel et al., 2008). In other words, employees have too many tasks at the same time. Problems with subsequent cognitive tasks, however, may be caused by depletion after behaviour regulation tasks (Muraven & Baumeister, 2000). This means that mental resources of employees are temporarily unavailable for cognitive tasks shortly after interactions with clients.

Thirdly, the included studies involved cognitive tasks that relied on combinations of cognitive functions (e.g. memory, perception, attention & executive functioning) instead of just one cognitive function. This means that it is not clear which of these functions were affected by emotion regulation processes. In professional practice this implies that it is still not possible to predict the type and severity of cognitive mistakes that occur in connection with emotional labour. We therefore argue that future studies should investigate to what extent each cognitive function (e.g. Broadbent et al., 1982) can be disturbed by concurrent emotion regulation. Ideally, different cognitive functions would be investigated at successive stages within the same experiment.

### *Blind spots in knowledge and future recommendations for applied studies*

Our systematic review provided insights into the effects of different types of emotional display rules on cognitive performance. However, it provided limited insights into the role of other contextual factors or the psychological mechanisms that ultimately cause reduced cognitive performance. In the next two paragraphs, we will offer some preliminary suggestions for studying these under-researched areas more systematically.

### *Identifying contextual factors that worsen cognitive performance*

We argue that it would be optimal to start by examining the roles of both situations and individual differences. These contextual factors have traditionally been identified as responsible for variance in emotion regulation processes (Gross, 2002). These factors should preferably be studied in real or simulated service contexts, because these are the usual conditions that demand individuals to combine emotional and cognitive performance. In private life this is much less important.

One way to obtain more insight into the essential characteristics of service contexts is to use field experiments or service simulations to compare the cognitive effects of the same emotional demands on emotional expressions during different situations (e.g. comparing situations that are provoking versus non-provoking, easy versus complex, and

familiar versus unfamiliar). An easier way to investigate the role of service contexts, is to determine to what extent various occupational groups suffer cognitive consequences of emotional labour. For this purpose, emotional labour scales (e.g. Brotheridge & Lee, 2003) can be combined with the workplace cognitive failures scale (Wallace & Chen, 2005).

Regarding individual differences, it should be noted that every stage of the process that occurs between the exposure to emotional demands on emotional expressions and cognitive performance requires different skills, and, therefore, could be influenced differently (Gross, 2002). Consequently, there are many candidate factors. We propose to start with individual differences related to the appraisal of situations (e.g. Kuppens et al., 2007) and the perception of emotional performance standards (e.g. Diefendorff & Richard, 2003). Additionally, it would be interesting to investigate the role of cognitive skills that are both related to emotional and cognitive performance, such as behavioural inhibition (e.g. Bonanno et al., 2004; Zelazo & Cunningham, 2007) and working memory span (e.g. Schmeichel et al., 2008). Overall, age can be considered as an moderating factor that intervenes on the emotion–cognition interplay (e.g. Charles & Carstensen, 2007; Scheibe & Blanchard-Fields, 2009). To investigate the role of individual differences, measuring instruments such as the Multidimensional Perfectionism Scale (Hewitt et al., 1991) could be used in addition to questionnaires for emotional labour and cognitive failure.

### *Revealing the intrapersonal processes behind cognitive side effects*

This review did not include intrapersonal mechanisms that impair cognitive performance after exposure to demands on emotional expressions. One possible intrapersonal explanation is that discrepancies between experienced emotions and expected emotional expressions, denoted as emotion-rule dissonance (e.g. Morris & Feldman, 1996; Zapf & Holz, 2006), distract individuals of the cognitive tasks. Another explanation is that expression focussed emotion regulation impairs cognitive performance because too much effort is required to assure that the expressed emotion is determined by desired emotional expressions instead of experienced emotions (emotional dissonance; e.g. Côté, 2005; Van Dijk & Brown, 2006). More insight into the effects of emotion-rule dissonance and emotional dissonance can be achieved by comparing data regarding self-reported emotions and accompanying physical arousals with objective reports of the emotional responses or perceived emotional expressions.

### *General implications for service management*

To return to the presumption of Grandey et al. (2015), there are indeed unintentional cognitive side effects of specific emotional display rules; such side effects may impede service delivery, and thus managers should be aware of this dark side of these management interventions. We found that these side effects particularly apply to emotional display rules that expect individuals to modify their emotional expressions to suit the circumstances of that moment. We determined that even cognitive tasks that are considered to be simple, such as speaking fluently, might suffer from these efforts. Moreover, they turn out to negatively affect even those tasks that are executed at a later time. This means that the next client may still experience the adverse consequences of the previous

efforts of the service employee to make a good impression. Another point of concern is that particular moments, as well as individual differences among employees, will most likely determine the extent to which emotional display rules cause problems. Because every service encounter is a new event and every employee is a unique individual, at any time, the same emotional display rule can have various risks for service quality. As long as there is limited knowledge about the underlying causes of their cognitive side effects, the usage of emotional display rules is no more than a game of chance.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

This research was supported by Grant 023-004-088 from the Dutch Research Council (NWO), awarded to Godelieve Hofstee.

## References

- The 15 publications that provided us with the 17 studies included in our review are marked with an asterisk (\*).
- Allen, J. A., Pugh, S. D., Grandey, A. A., & Groth, M. (2010). Following display rules in good or bad faith?: Customer orientation as a moderator of the display rule-emotional labor relationship. *Human Performance*, 23(2), 101–115. <https://doi.org/10.1080/08959281003621695>
- Ashforth, B. E., & Humphrey, R. H. (1993). Emotional labor in service roles: The influence of identity. *Academy of Management Review*, 18(1), 88–115. <https://doi.org/10.5465/amr.1993.3997508>
- \*Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology*, 74(5), 1252–1265. <https://doi.org/10.1037/0022-3514.74.5.1252>
- \*Beatty, G. F., Fawver, B., Hancock, G. M., & Janelle, C. M. (2014). Regulating emotions uniquely modifies reaction time, rate of force production, and accuracy of a goal-directed motor action. *Human Movement Science*, 33, 1–13. <https://doi.org/10.1016/j.humov.2013.12.001>
- Bonanno, G. A., Papa, A., Lalande, K., Westphal, M., & Coifman, K. (2004). The importance of being flexible: The ability to both enhance and suppress emotional expression predicts long-term adjustment. *Psychological Science*, 15(7), 482–487. <https://doi.org/10.1111/j.0956-7976.2004.00705.x>
- Broadbent, D. E., Cooper, P. F., FitzGerald, P., & Parkes, K. R. (1982). The cognitive failures questionnaire (CFQ) and its correlates. *British Journal of Clinical Psychology*, 21(1), 1–16. <https://doi.org/10.1111/j.2044-8260.1982.tb01421.x>
- Brotheridge, C. M., & Lee, R. T. (2003). Development and validation of the emotional labour scale. *Journal of Occupational and Organizational Psychology*, 76(3), 365–379. <https://doi.org/10.1348/096317903769647229>
- Charles, S. T., & Carstensen, L. L. (2007). Emotion regulation and aging. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 3–26). Guilford.
- Côté, S. (2005). A social interaction model of the effects of emotion regulation on work strain. *Academy of Management Review*, 30(3), 509–530. <https://doi.org/10.5465/amr.2005.17293692>
- Diefendorff, J. M., & Gosserand, R. H. (2003). Understanding the emotional labor process: A control theory perspective. *Journal of Organizational Behavior*, 24(8), 945–959. <https://doi.org/10.1002/job.230>

- Diefendorff, J. M., & Richard, E. M. (2003). Antecedents and consequences of emotional display rule perceptions. *Journal of Applied Psychology, 88*(2), 284–294. <https://doi.org/10.1037/0021-9010.88.2.284>
- Diefendorff, J. M., Richard, E. M., & Croyle, M. H. (2006). Are emotional display rules formal job requirements? Examination of employee and supervisor perceptions. *Journal of Occupational and Organizational Psychology, 79*(2), 273–298. <https://doi.org/10.1348/096317905X68484>
- \*Dillon, D. G., Ritchey, M., Johnson, B. D., & LaBar, K. S. (2007). Dissociable effects of conscious emotion regulation strategies on explicit and implicit memory. *Emotion, 7*(2), 354–365. <https://doi.org/10.1037/1528-3542.7.2.354>
- Duffy, M. K., Shaw, J. D., Hoobler, J. M., & Tepper, B. J. (2010). A time-based perspective on emotion regulation in emotional-labor performance. *Research in Personnel and Human Resources Management, 29*, 87–113. [https://doi.org/10.1108/S0742-7301\(2010\)0000029005](https://doi.org/10.1108/S0742-7301(2010)0000029005)
- Eichengreen, B., & Gupta, P. (2013). The two waves of service-sector growth. *Oxford Economic Papers, 65*(1), 96–123. <https://doi.org/10.1093/oeq/gpr059>
- Ekman, P. (1984). Expression and the nature of emotion. In K. Scherer & P. Ekman (Eds.), *Approaches to emotion* (pp. 319–344). Erlbaum.
- \*Goldberg, L. S., & Grandey, A. A. (2007). Display rules versus display autonomy: Emotion regulation, emotional exhaustion, and task performance in a call center simulation. *Journal of Occupational Health Psychology, 12*(3), 301–318. <https://doi.org/10.1037/1076-8998.12.3.301>
- Grandey, A. A. (2000). Emotion regulation in the workplace: A new way to conceptualize emotional labor. *Journal of Occupational Health Psychology, 5*(1), 95–110. <https://doi.org/10.1037/1076-8998.5.1.95>
- Grandey, A. A. (2003). When “the show must go on”: surface acting and deep acting as determinants of emotional exhaustion and peer-rated service delivery. *Academy of Management Journal, 46*, 86–96. <https://doi.org/10.2307/30040678>
- Grandey, A. A., Diefendorff, J. M., & Rupp, D. E. (2013). Bringing emotional labor into focus: A review and integration of three research lenses. In A. A. Grandey, J. M. Diefendorff & D. E. Rupp (Eds.), *Emotional labor in the 21st century. Diverse perspectives on emotion regulation at work* (pp. 3–27). Routledge.
- Grandey, A. A., Rupp, D., & Brice, W. N. (2015). Emotional labor threatens decent work: A proposal to eradicate emotional display rules. *Journal of Organizational Behavior, 36*(6), 770–785. <https://doi.org/10.1002/job.2020>
- Grandey, A., Foo, S. C., Groth, M., & Goodwin, R. E. (2012). Free to be you and me: A climate of authenticity alleviates burnout from emotional labor. *Journal of Occupational Health Psychology, 17*(1), 1–14. <https://doi.org/10.1037/a0025102>
- Grandjean, D., Sander, D., & Scherer, K. R. (2008). Conscious emotional experience emerges as a function of multilevel, appraisal-driven response synchronization. *Consciousness and Cognition, 17*(2), 484–495. <https://doi.org/10.1016/j.concog.2008.03.019>
- Gross, J. J. (1999). Emotion regulation: Past, present, future. *Cognition & Emotion, 13*(5), 551–573. <https://doi.org/10.1080/026999399379186>
- Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology, 39*(3), 281–291. <https://doi.org/10.1017/S0048577201393198>
- Gross, J. J., & Thompson, R. A. (2007). Emotion regulation: Conceptual foundations. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 3–26). Guilford.
- Gross, J. J., Richards, J. M., & John, O. P. (2006). Emotion regulation in everyday life. In D. K. Snyder, J. A. Simpson, & J. N. Hughes (Eds.), *Emotion regulation in couples and families: Pathways to dysfunction and health* (pp. 13–35). American Psychological Association.
- \*Hayes, J. P., Morey, R. A., Petty, C. M., Seth, S., Smoski, M. J., McCarthy, G., & LaBar, K. S. (2010). Staying cool when things get hot: Emotion regulation modulates neural mechanisms of memory encoding. *Frontiers in Human Neuroscience, 4*, 230. <https://doi.org/10.3389/fnhum.2010.00230>
- Hewitt, P. L., Flett, G. L., Turnbull-Donovan, W., & Mikail, S. F. (1991). The Multidimensional Perfectionism Scale: Reliability, validity, and psychometric properties in psychiatric samples. *Psychological Assessment: A Journal of Consulting and Clinical Psychology, 3*(3), 464–468. <https://doi.org/10.1037/1040-3590.3.3.464>

- Hochschild, A. R. (2003). *The managed heart: Commercialization of human feeling*. University of California Press.
- Hülshager, U. R., & Schewe, A. F. (2011). On the costs and benefits of emotional labor: A meta-analysis of three decades of research. *Journal of Occupational Health Psychology, 16*(3), 361–389. <https://doi.org/10.1037/a0022876>
- Humphrey, R. H., Ashforth, B. E., & Diefendorff, J. M. (2015). The bright side of emotional labor. *Journal of Organizational Behavior, 36*(6), 749–769. <https://doi.org/10.1002/job.2019>
- \*Johnson, S. E., Mitchell, M. A., Bean, M. G., Richeson, J. A., & Shelton, J. N. (2010). Gender moderates the self-regulatory consequences of suppressing emotional reactions to sexism. *Group Processes & Intergroup Relations, 13*(2), 215–226. <https://doi.org/10.1177/1368430209344867>
- Kinman, G. (2009). Emotional labour and strain in “front-line” service employees. *Journal of Managerial Psychology, 24*(2), 118–135. <https://doi.org/10.1108/02683940910928847>
- Kuppens, P., Van Mechelen, I., Smits, D. J., De Boeck, P., & Ceulemans, E. (2007). Individual differences in patterns of appraisal and anger experience. *Cognition and Emotion, 21*(4), 689–713. <https://doi.org/10.1080/02699930600859219>
- Lee, C., An, M., & Noh, Y. (2015). The effects of emotional display rules on flight attendants’ emotional labor strategy, job burnout and performance. *Service Business, 9*(3), 409–425. <https://doi.org/10.1007/s11628-014-0231-4>
- Lewig, K. A., & Dollard, M. F. (2003). Emotional dissonance, emotional exhaustion and job satisfaction in call centre workers. *European Journal of Work and Organizational Psychology, 12*(4), 366–392. <https://doi.org/10.1080/13594320344000200>
- Mastracci, S. H., Guy, M. E., & Newman, M. A. (2012). *Emotional labor and crisis response: Working on the razor’s edge*. M.E. Sharpe.
- Matthews, G., Davies, D. R., Westerman, S. J., & Stammers, R. B. (2000). *Human performance: Cognition, stress, and individual differences*. Psychology Press.
- Mauss, I. B., Cook, C. L., Cheng, J. Y. J., & Gross, J. J. (2007). Individual differences in cognitive reappraisal: Experiential and physiological responses to an anger provocation. *International Journal of Psychophysiology, 66*(2), 116–124. <https://doi.org/10.1016/j.ijpsycho.2007.03.017>
- Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence? In P. Salovey & D. J. Sluyter (Eds.), *Emotional development and emotional intelligence* (pp. 3–31). Basic Books.
- Morgan, J., & Krone, K. (2001). Bending the rules of “professional” display: Emotional improvisation in caregiver performances. *Journal of Applied Communication Research, 29*(4), 317–340. <https://doi.org/10.1080/00909880128114>
- Morgeson, F. P., Mitchell, T. R., & Liu, D. (2015). Event system theory: An event-oriented approach to the organizational sciences. *Academy of Management Review, 40*(4), 515–537. <https://doi.org/10.5465/amr.2012.0099>
- Morris, J. A., & Feldman, D. C. (1996). The dimensions, antecedents, and consequences of emotional labor. *Academy of Management Review, 21*(4), 986–1010. <https://doi.org/10.5465/amr.1996.9704071861>
- Mortillaro, M., Mehu, M., & Scherer, K. R. (2013). The evolutionary origin of multimodal synchronization and emotional expression. In E. Altenmüller, S. Schmidt, & E. Zimmerman (Eds.), *Evolution of emotional communication: From sounds in nonhuman mammals to speech and music in man* (pp. 3–25). Oxford University Press.
- Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin, 126*(2), 247–259. <https://doi.org/10.1037/0033-2909.126.2.247>
- Nahrgang, J. D., Morgeson, F. P., & Hofmann, D. A. (2011). Safety at work: A meta-analytic investigation of the link between job demands, job resources, burnout, engagement, and safety outcomes. *Journal of Applied Psychology, 96*(1), 71–94. <https://doi.org/10.1037/a0021484>
- Näring, G., Briët, M., & Brouwers, A. (2006). Beyond demand–control: Emotional labour and symptoms of burnout in teachers. *Work & Stress, 20*(4), 303–315. <https://doi.org/10.1080/02678370601065182>
- Niven, K., Totterdell, P., & Holman, D. (2009). A classification of controlled interpersonal affect regulation strategies. *Emotion, 9*(4), 498–509. <https://doi.org/10.1037/a0015962>

- Normann, R. (1984). *Service management*. Wiley.
- Payne, J. (2009). Emotional labour and skill: A reappraisal. *Gender, Work & Organization*, 16(3), 348–367. <https://doi.org/10.1111/j.1468-0432.2009.00448.x>
- \*Pearson, A. R., Dovidio, J. F., Phillips, C. E., & Onyeador, I. N. (2013). Attitude–goal correspondence and interracial interaction: Implications for executive function and impression formation. *Journal of Experimental Social Psychology*, 49(5), 907–914. <https://doi.org/10.1016/j.jesp.2013.03.015>
- Peart, F. M., Roan, A. M., & Ashkanasy, N. M. (2012). Trading in emotions: A closer examination of emotional labor. In N. M. Ashkanasy, C. E. J. Härtel, & W. J. Zerbe (Eds.), *Experiencing and managing emotions in the workplace. Research on emotion in organizations, volume 8* (pp. 279–303). Emerald Group.
- \*Perbandt, K. (2007). Differential effects of incongruent anger expression on memory performance. *Journal of Individual Differences*, 28(3), 129–137. <https://doi.org/10.1027/1614-0001.28.3.129>
- Peters, B. J., Overall, N. C., & Jamieson, J. P. (2014). Physiological and cognitive consequences of suppressing and expressing emotion in dyadic interactions. *International Journal of Psychophysiology*, 94(1), 100–107. <https://doi.org/10.1016/j.ijpsycho.2014.07.015>
- Petticrew, M., & Roberts, H. (2008). *Systematic reviews in the social sciences: A practical guide*. John Wiley & Sons.
- Prentice, C. (2013). Emotional labour and its consequences: The moderating effect of emotional intelligence. In W. J. Zerbe, N. M. Ashkanasy, & C. E. J. Härtel (Eds.), *Individual sources, dynamics, and expressions of emotion (research on emotion in organizations, volume 9)* (pp. 187–201). Emerald Group.
- Rafaelli, A., & Sutton, R. I. (1987). Expression of emotion as part of the work role. *Academy of Management Review*, 12(1), 23–37. <https://doi.org/10.5465/amr.1987.4306444>
- \*Richards, J. M., Butler, E. A., & Gross, J. J. (2003). Emotion regulation in romantic relationships: The cognitive consequences of concealing feelings. *Journal of Social and Personal Relationships*, 20(5), 599–620. <https://doi.org/10.1177/02654075030205002>
- \*Richards, J. M., & Gross, J. J. (1999). Composure at any cost? The cognitive consequences of emotion suppression. *Personality and Social Psychology Bulletin*, 25(8), 1033–1044. <https://doi.org/10.1177/01461672992511010>
- \*Richards, J. M., & Gross, J. J. (2000). Emotion regulation and memory: The cognitive costs of keeping one's cool. *Journal of Personality and Social Psychology*, 79(3), 410–424. <https://doi.org/10.1037/0022-3514.79.3.410>
- \*Rohrmann, S., Bechtoldt, M. N., Hopp, H., Hodapp, V., & Zapf, D. (2011). Psychophysiological effects of emotional display rules and the moderating role of trait anger in a simulated call center. *Anxiety, Stress and Coping*, 24(4), 421–438. <https://doi.org/10.1080/10615806.2010.530262>
- \*Roth, G., Benita, M., Amrani, C., Shachar, B. H., Asoulin, H., Moed, A., Bibi, U., & Kanat-Maymon, Y. (2014). Integration of negative emotional experience versus suppression: Addressing the question of adaptive functioning. *Emotion*, 14(5), 908–919. <https://doi.org/10.1037/a0037051>
- Rupp, D. E., & Spencer, S. (2006). When customers lash out: The effects of customer interactional injustice on emotional labor and the mediating role of discrete emotions. *Journal of Applied Psychology*, 91(4), 971–978. <https://doi.org/10.1037/0021-9010.91.4.971>
- Sayers, A. (2008). Tips and tricks in performing a systematic review. *British Journal of General Practice*, 58(547), 136.1–13136. <https://doi.org/10.3399/bjgp08X277168>
- Schaubroeck, J., & Jones, J. R. (2000). Antecedents of workplace emotional labor dimensions and moderators of their effects on physical symptoms. *Journal of Organizational Behavior*, 21(2), 163–183. [https://doi.org/10.1002/\(SICI\)1099-1379\(200003\)21:2<163::AID-JOB37>3.0.CO;2-L](https://doi.org/10.1002/(SICI)1099-1379(200003)21:2<163::AID-JOB37>3.0.CO;2-L)
- Scheibe, S., & Blanchard-Fields, F. (2009). Effects of regulating emotions on cognitive performance: What is costly for young adults is not so costly for older adults. *Psychology and Aging*, 24(1), 217–223. <https://doi.org/10.1037/a0013807>

- Scherer, K. R. (2005). What are emotions? And how can they be measured? *Social Science Information*, 44(4), 695–729. <https://doi.org/10.1177/0539018405058216>
- \*Schmeichel, B. J. (2007). Attention control, memory updating, and emotion regulation temporarily reduce the capacity for executive control. *Journal of Experimental Psychology: General*, 136(2), 241–255. <https://doi.org/10.1037/0096-3445.136.2.241>
- Schmeichel, B. J., Volokhov, R. N., & Demaree, H. A. (2008). Working memory capacity and the self-regulation of emotional expression and experience. *Journal of Personality and Social Psychology*, 95(6), 1526–1540. <https://doi.org/10.1037/a0013345>
- Siemer, M., Mauss, I., & Gross, J. J. (2007). Same situation--Different emotions: How appraisals shape our emotions. *Emotion*, 7(3), 592–600. <https://doi.org/10.1037/1528-3542.7.3.592>
- Sliter, M., Jex, S., Wolford, K., & McInnerney, J. (2010). How rude! emotional labor as a mediator between customer incivility and employee outcomes. *Journal of Occupational Health Psychology*, 15(4), 468–481. <https://doi.org/10.1037/a0020723>
- Thoits, P. A. (1990). Emotional deviance: Research agendas. In T. D. Kemper (Ed.), *Research agendas in the sociology of emotions* (pp. 180–203). State University of New York Press.
- Van Dijk, P. A., & Brown, A. K. (2006). Emotional labour and negative job outcomes: An evaluation of the mediating role of emotional dissonance. *Journal of Management and Organization*, 12(2), 101–115. <https://doi.org/10.5172/jmo.2006.12.2.101>
- \*Vohs, K. D., & Schmeichel, B. J. (2003). Self-regulation and extended now: Controlling the self alters the subjective experience of time.. *Journal of Personality and Social Psychology*, 85(2), 217–230. <https://doi.org/10.1037/0022-3514.85.2.217>
- Wallace, J. C., & Chen, G. (2005). Development and validation of a work-specific measure of cognitive failure: Implications for occupational safety. *Journal of Occupational and Organizational Psychology*, 78(4), 615–632. <https://doi.org/10.1348/096317905X37442>
- \*Wang, Y., Yang, L., & Wang, Y. (2014). Suppression (but not reappraisal) impairs subsequent error detection: An ERP study of emotion regulation's resource-depleting effect. *PloS One*, 9(4), e96339. <https://doi.org/10.1371/journal.pone.0096339>
- World Bank Group. (2017). Services, etc., value added (% of GDP). <http://data.worldbank.org/indicator/NV.SRV.TETC.ZS>
- Zapf, D. (2002). Emotion work and psychological well-being. *Human Resource Management Review*, 12(2), 237–268. [https://doi.org/10.1016/S1053-4822\(02\)00048-7](https://doi.org/10.1016/S1053-4822(02)00048-7)
- Zapf, D., & Holz, M. (2006). On the positive and negative effects of emotion work in organizations. *European Journal of Work and Organizational Psychology*, 15(1), 1–28. <https://doi.org/10.1080/13594320500412199>
- Zapf, D., Vogt, C., Seifert, C., Mertini, H., & Isic, A. (1999). Emotion work as a source of stress: The concept and development of an instrument. *European Journal of Work and Organizational Psychology*, 8(3), 371–400. <https://doi.org/10.1080/135943299398230>
- Zelazo, P. D., & Cunningham, W. A. (2007). Executive function: Mechanisms underlying emotion regulation. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 135–158). Guilford Press.
- Zeng, Z., Pantic, M., Roisman, G. I., & Huang, T. S. (2009). A survey of affect recognition methods: Audio, visual, and spontaneous expressions. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 31(1), 39–58. <https://doi.org/10.1109/TPAMI.2008.52>