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Effort-reward imbalance in academic employees: examining different reward systems

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Abstract:	This study draws upon the effort-reward imbalance (ERI) model of job stress to predict mental and physical health in academic employees working in UK universities. It examines the main and interactive effects of extrinsic efforts over time and the three reward systems of the ERI model independently (i.e. promotion, esteem and security rewards). The main and interactive effects of intrinsic effort (known as overcommitment) in predicting health status are also examined. A sample of 458 academic employees completed ERI scales at baseline and the health measures 14 months later. The results showed that higher extrinsic effort, lower esteem and security rewards and an imbalance between efforts and esteem rewards assessed at Time 1 predicted mental health status on follow-up. Physical health symptoms were predicted by higher extrinsic effort and lower security rewards. Overcommitment was an independent risk factor for both mental and physical health. No further contribution was made to the variance in either outcome by the other effort-reward ratios independently or by their interactions with overcommitment. Interventions are suggested that have potential to reduce extrinsic and intrinsic efforts and increase rewards in the university sector.

I would like to see the theoretical and practical contributions of the study approached in the introduction	The paper was submitted for inclusion in a special edition on work-related wellbeing in academic employees. It extends knowledge of the ERI model in this context in two ways: a) by obtaining data at two time points and b) by examining the effects of each of the three transmitter systems. This has now been emphasised more strongly in the introduction
The text would be clearer if the rationale of each hypothesis was presented and immediately followed by the specific hypothesis to which it is concerned upon	We considered this, but following the approach used in similar studies that have tested hypotheses derived from the ERI mode l(e.g. Derycke et al. 2010), we decided to provide the hypotheses together before the method section. We also thought it might be cumbersome for the reader to restructure the paper to provide a rationale for each hypothesis in turn and then discuss the key role of context
The sample and data collection procedures could be joined	This has been done.
Why have the authors chosen to use multiple regression analysis instead of structural equation modeling which is a more powerful tool to analyze the data?	SEM is undoubtedly a powerful tool but can be challenging to use in studies emphasising interaction-based hypotheses – see Little et al (2006). Moreover, this study is primarily about prediction using an extended model, rather than testing an underlying theoretical model, and as such the regression models seem more appropriate. In addition, this approach means that the models are the same when we are comparing effects across the two outcomes. Finally, the regression approach is likely to provide more power to detect the interactions than using SEM with latent variables (as there would be more parameters to estimate).
The results are presented without any mention to the hypotheses being confirmed or not	The hypotheses are discussed in the results section
The ratio of efforts to rewards and the mean level of overcommitment should be presented on the result section and	A ratio of efforts to rewards has now been calculated for the three reward systems. The statistics are now provided in the

then discussed on the discussion section	results section and (along with the composite ERI) compared with published norms.
The discussion should bring the implications of the results for the advancement of the knowledge on the scope of ERI model	As mentioned in response to point 1 above, this study aimed to apply the extended ERI model to explaining work-related wellbeing in academic employees. Its contribution to knowledge in providing further insight in this occupational context has been further emphasised.

Reviewer 2

Abstract is confusion and contains too many details (e.g. I recommend not to mention the reward subdimensions). Please focus more and write more condensed and mention 'hypotheses derived from the ERI model were tested among UK academics in a longitudinal way' Results can be mentioned by referring to particular subdimensions, according to me.	Some explanation of the reward dimensions is required for the reader to make sense of the approach taken – i.e. to examine the effects of each of the three reward systems. The length of the explanation has, however, been reduced
Given the results, I would recommend to delete the full last sentence, it's an overinterpretation according to me. You can mention, e.g. 'implications of the results and shortcomings of the study are discussed.'	This information is needed in view of the theme of the special edition: i.e. to provide insight into work-related wellbeing in academic employees and how this might be improved. This was emphasised in the call for papers
page 3 replace the current heading Background into Introduction	Done
page 4 : 10th line from above : typing errro Coatzee in spelled differently in reference list (p.19)	This should be Coetzee and has been amended

page 4 : 15th line from above : typing error : replace [2011] into (2011)	We have checked this. When brackets are required inside parenthesis to create a double enclosure, I believe the APA guide indicates that square brackets should be used. We may have misinterpreted the guidelines, but any errors could be highlighted in the editorial process if the paper is accepted.
Given the results of the meta-analyis of Siegrist & Li (2016) regarding the main and interactive effects of overcommitment, which the authors rightly cite on page 6, I do not understand why authors keep testing ERI's intrinsic and interactive hypotheses, in the classic/similar way as in the past. The authors should build, criticize or at least offer an alternative or adding something new (methodologically or content wise) to advance the ERI field or the stress management practice. They only argue (1) 'differential effects of the three types of rewards and (2) overcommitment should be studied further.(page 8). In my view the heading 'extending the ERI-model' is misleading as both issues (three types of rewards and overcommitment) are not new and already studied by two previous studies and by definition already incorporated in the original ERI-model. Maybe authors should mention as heading 'Specificity of rewards' . Indeed also in more recent jobstress model such as the Demand induced strain compensation model (de Jonge & Dormann, 2003) the importance of the specificity (compared to generic conceptualizations and operationalizations of job demands and job resources is stressed as well ! This is also one of the main critics the job demand-job resources model (Bakker & colleagues) gets, job demands and job resources are defined too generic. In other words authors could argue that although Siegrist is distinguishing three different types of rewards in his model, researchers are inclined or mainly define and operationalize rewards in a generic way,.... with the	As mentioned in response to the first reviewers' point above, this study did not aim to extend the ERI theory as such; it applied an extended ERI model to predicting self-reported health status in academic employees and tested the main and moderating effects inherent in the model in this context. This is in line with the call for papers for the special edition of the journal that emphasised the need for papers: a) with a prospective design; and b) that apply existing models of job stress to predicting strain in this context. However, we believe that the paper has also extended knowledge of the model by examining the differential effects of the three reward systems in the context of academic employees and highlighting the importance of specificity. The reviewer correctly identifies that the heading is misleading. The word 'extending' has now been removed. The need for specificity has now been further highlighted and strengthened with further references. The two studies that have previously tested the effects of the different reward systems have been reviewed.

exception of the two mentioned studies (Van Vegchel et al, 2002) and Lehr et al., 2013) which illustrates empirically the importance of distinguishing between different sources/types of rewards. As the framing and the offering of added value are important in writing and reviewing scientific papers, I recommend author(s) to frame, sell and position their study better. Regarding the specificity issue I think this is easily to do. However regarding their second unique selling proposition (overcommitment) I do not see yet what authors did more or differently regarding 'overcommitment' in comparison with previous research. To summarize my point : The research gap and the potential incremental value, compared to previous research, legitimzing the proposed research remains too vague and should be me more explicit and substantial.	
Hypotheses unclear *The introduction section ends now with five predictions. Each of the mentioned predictions (page 10) should be labeled as a hypothesis and should reformulated. *I recommend to mention, in line with Siegrist, intrinssic hypothesis, extrinsic hypothesis and interaction hypothesis. *I recommend to reformulate each hypothesis more precise, in a testable way. P1 en P3 'related' is too vague ; P2 : reformulate 'an interactive effect' (does it refer to a mitigating or an enhancing effect ?); P5 : 'efforts and rewards in combination' is too vague;... *It is not common in literature nor Siegrist explicit formulate main hypotheses regarding both efforts and rewards as author(s) wrongly do in their first prediction. Siegrist only formulate a main effect of overcommitment, as rightly	As recommended, the predictions have now been reframed as hypotheses in line with Siegrist's approach. The fact that the study tests several hypotheses, not all of which are directly derived from Siegrist's predictions but have been included in other studies using the ERI framework, has been highlighted. Hypotheses have been added to reflect main effects of efforts and rewards. The article suggested was very helpful.

formulated by the authors in their third prediction. Only when Siegrists' interactive hypothesis is tested one should control for both main effects, for statistical reasons. This this not imply the necessity to formulate main effect hypotheses for both of them in a separate hypothesis. *I recommend the authors to inspire them for their hypothesis formulation to the following, also prospective paper: Derycke, H., Vlerick, P., Burnay, N., Decleire, C., D'Hoore, W., Hasselhorn, H., & Braeckman, L. (2010). Impact of the Effort-Reward Imbalance Model on Intent to leave among Belgian healthcare workers: a prospective study. Journal of Occupational and Organizational Psychology, 83(4), 879-893.	
The introduction section argues in favor of the importance of differentiating between the three type of rewards and especially that esteem would be most salient in academics compared to the two other type of rewards. It's surprising that authors formulate none differential research question or hypothesis accordingly.	Thank you for this suggestion. We suggest that academics may be more motivated by the need for esteem and respect, but do not wish to represent this in a specific hypothesis. We also suggest that overcommitment may exacerbate the effects of different combinations of extrinsic efforts and rewards. The study aimed to explore the relevance of each of the three reward systems in the occupational context more generally rather than state more specific hypotheses.
As the key dependent variables are physical and mental health, I do not understand why the state of the art, remaining research voids in current health literature remains untouched by the authors. At least they could stress the importance of work characteristics with regard to health.	We have discussed research that has found associations between work-related stressors and health outcomes in academics and also highlighted the implications of work characteristics, such as ERI, for physical health status. As discussed above, however, this study does not aim to address gaps in the literature regarding the prediction of health status.
Basic information regarding the method is lacking : how was the data collected (paper and pencil or electronically) ?; non respons analysis is lacking (e.g. to what extent do non	Information is provided that data were collected via an online questionnaire. Non-response analysis has now been conducted.

responders differ from the responders at follow up ?) ; informed consent ? why 14 months as time lag ?; anonymity?; confidentially ?; how were data of times measurements combined (code?); how were participants recruited ?	The follow up period was supposed to be 12 months, but a delay meant that it was 14 months. Information on the process used to match data is now included. Details of ethical clearance and assurances of anonymity and confidentiality is now provided
A motivation of the two control variables is lacking; As health is multifactorial determined, I wondered why only these two were selected ?	Age is a key factor in predicting physical health status (as age increases the risk of ill health rises) and some epidemiological studies of work-related stress indicate that women higher levels of mental and physical health problems than men. Research conducted by the UK Health and Safety Executive in the 3 year period 2014 to 2017 found that the prevalence rate for work-related stress, depression and anxiety is significantly higher than males and rates were also higher in the middle aged groups. This has now been noted.
The operationalization of physical health by means of a single item is questionable, please insert the full item in the text (page 12)	Single items of health status (and other factors such as work-related stress, job satisfaction and quality of life) are commonly used in cohort studies and large-scale surveys. They are recognised to be reliable with strong concurrent and discriminant scale performance with established health status measures and with other health-related outcomes such as doctors' visits (e.g. see a meta analysis by De Salvo et al. 2006). The alternative was to use a checklist of health symptoms, but this was considered too sensitive for the purposes of the study. It is recognised, however, that the measure of mental health (the GHQ-12) is more sensitive than the item assessing physical health. The potential disadvantages of using a single item are now acknowledged in the discussion section

The operationalization of mental health by means of the GHQ-12 is common. Please insert (on page 12) which GHQ-12 scoring method was used by the author(s) (how were scalescores calculated) (e.g. Likert scoring or dichotomous soring; scale sumscore or mean itemscore)	Apologies for not explaining this. Likert scoring was used in this study and item means calculated. This information is now provided on page 12
page 13, 4th line from above: please insert that the number ('three') of three-way interactions added in step 5.	This has now been amended
I would like to complement the authors for opting for a prospective research design. However the scientific value of the reported results is limited as authors did not measure at baseline both dependent variables. As a consequence they can not control in their data-analyses for baseline levels of mental health and physical health. In all analyses the authors should control for the baseline (T1) level of their dependent variables. This would strengthen the paper and exclude several alternative explanations. If the authors can't then this would be a major shortcoming.	Unfortunately measures of physical and mental health status were not obtained at baseline. The disadvantages of this are discussed.
Given that 0 out of the 6 tested two-way interactions and 0 out of the 6 tested three-way interactions were statically significant (see Table 1) and as author(s) did not control for the baseline levels of both dependent variables in their statistical analyses, I recommend the authors to temper their interpretations of their results in favor of the ERI-model.	This has now been edited
Given my previous remark, I really do not understand why author(s) are offering none content wise and none methodological explanation(s) for their results (0 out 12 tested	This has now been discussed

interactions are statistical significant). The discussion section would profit from inserting some explanations for the non moderating effects of the three type of rewards and overcommitment. Please deepen and reflect upon the results.	
The research limitations (page 18) are mentioned too limited	More limitations have been added
Suggestions for further research and implications of the results for practise are lacking.	This has now been expanded
In a discussion section one should refer back to each of the in the introduction section mentioned hypotheses/predictions. I regret this is not the case.	To avoid repetition, the hypotheses have been discussed in the results section only but each has been discussed in the discussion
Why do author(s) do not refer too or cite in their discussion section more advanced and more recent job stress models such as job demands resources model (JD-R model) or the Demand induced strain compensations model (DISC), these two models are in essence also gronded in and built upon the ERI-model (and JDC-S model) ? There is more then only Siegrists' model, eventhough it is an importnat one.	See the responses to previous points above. The JDR model and illegitimate tasks in relation to expanding ERI have been discussed.

Title page with All Author Information

Effort-reward imbalance in academic employees: examining different reward systems

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EFFORT-REWARD IMBALANCE AND HEALTH IN ACADEMIC EMPLOYEES: EXAMINING DIFFERENT REWARD SYSTEMS

Abstract

This study draws on the effort-reward imbalance (ERI) model of job stress to predict mental and physical health in academic employees working in UK universities. It examines the main and interactive effects of extrinsic efforts over time as well as the independent contributions of the three reward systems of the model (i.e. promotion, esteem and security rewards). The main and interactive effects of intrinsic effort (known as overcommitment) in predicting health status are also examined. A sample of 458 academic employees completed ERI scales at baseline and the health measures 14 months later. Higher extrinsic effort, lower esteem and security rewards and an imbalance between efforts and esteem rewards assessed at Time 1 were found to predict mental health status on follow-up. Physical health symptoms were predicted by higher extrinsic effort and lower security rewards. Overcommitment was an independent risk factor for both mental and physical health. No further contribution was made to the variance in either outcome by the other effort-reward ratios independently or by their interactions with overcommitment. Interventions are suggested that have potential to reduce extrinsic and intrinsic efforts and increase rewards in the university sector.

Keywords: effort-reward imbalance; overcommitment; stress; health; academic employees

Introduction

Studies conducted in several countries have highlighted the increasingly stressful nature of academic work (Barkhuizen, & Rothmann, 2008; Biron, Brun, & Ivers, 2008; Kinman, & Court, 2010; Padilla, & Thompson, 2015; Reddy, & Poornima, 2012; Sun, Wu, & Wang, 2011; Tytherleigh, Webb, Cooper, & Ricketts, 2005; Winefield et al. 2008). Research findings indicate that the extensive and ongoing change agenda experienced in the university sector over the last decade or so has led to perceptions of increased workloads and reduced key resources, such as job control, support and role clarity (Kinman, Jones, & Kinman, 2006; Kinman, & Wray, 2015; Winefield, et al. 2008). The increasingly diverse nature of academic work and growing scrutiny of performance across different domains has also increased the potential for role overload and conflict in the sector, further intensifying the risk of stress (Darabi, Macaskill, & Reidy, 2016; Idris, 2011; Kinman, & Wray, 2016; Whitchurch, & Gordon, 2010).

Several studies of academic staff indicate that mental health in the sector is comparatively poor. A systematic review of burnout research conducted with university teaching staff concluded they were at a similar risk to 'highly stressed' groups such as health and social care professionals (Watts, & Robertson, 2011). Moreover, large-scale studies that have used the General Health Questionnaire (GHQ-12: Goldberg, & Williams, 1988) have found a higher incidence of mental health problems among university employees than many other occupational groups (Biron, et al. 2008; Kinman, & Wray, 2016; Winefield, et al., 2008). It should be noted, however, that some of these studies have sampled other types of employee as well those on academic contracts. A range of factors, such as heavy workload, poor management, job insecurity, low autonomy, poor resources and communication, limited

career development prospects, onerous performance management systems, frequent interruptions, lack of recognition and reward, and conflict between work and personal life, has been found to make particularly strong contributions to the distress reported by academic employees (Barkhuizen, & Rothmann, 2008; Gillespie, Walsh, Winefield, & Stough, 2010; Kinman, 2014; Kinman, & Jones, 2004); Pop-Vasileva, Baird, & Blair, 2011; Winefield, et al. 2008). Fewer studies have examined associations between job-related stressors and physical health in the sector, but an increased risk of symptoms such as fatigue, headaches, muscular pain, sleeping difficulties and susceptibility to infectious disease has been identified (Coetzee, & Rothmann, 2005; Kinman, 2008).

Although some insight has been gained into the aspects of academic work that can threaten staff wellbeing, most studies of the sector are cross-sectional, and few have drawn upon theoretical frameworks of job-related stress (for an exception, see Boyd et al. [2011] who tested the job demands-resources model longitudinally in a sample of Australian academics). To enhance knowledge of the underlying mechanisms of stress in academic employees, the current study tests an expanded version of the Effort-Reward Imbalance model (ERI: Siegrist, 1996) in explaining mental and physical health in the sector over time. For several reasons discussed later in this paper, the ERI model could be considered particularly relevant to the current working environment and personal characteristics inherent in this occupational group.

Drawing upon social exchange theory (Blau, 1964), the ERI model conceptualises strain as arising from an imbalance between the efforts that people consider they invest in their work and the rewards that they receive. Wellbeing will typically be higher when efforts are lower and rewards are higher, but the model predicts that employees who believe that the benefits

they gain from their job are commensurate with their efforts will be healthier than those who perceive a mismatch between these key factors (Siegrist, 1996). These effects are explained by perceptions of inequity engendering negative emotions (such as anger and frustration) that, in turn, invoke autonomic arousal thereby impairing physical and mental health (Siegrist 2002).

The ERI model differentiates between two sources of effort: extrinsic and intrinsic. Extrinsic efforts encompass a series of external demands and obligations imposed on employees such as workload, time pressure, interruptions and responsibility. Intrinsic effort, more commonly known as overcommitment, considers the motivations of the individual employee. It is defined as "a set of attitudes, behaviours and emotions that reflect excessive striving in combination with a strong desire of being approved and esteemed" (Siegrist, 2001, p. 55). Overcommitment is thought to influence the health of employees in two ways: a) direct effects, where being overcommitted to the job role limits opportunities to withdraw physically and mentally from work, thus impairing recovery processes ; and b) indirect effects, where a need for control and approval encourages overcommitted employees to invest more effort into their work, even under low reward conditions, therefore increasing their vulnerability to strain (Siegrist, 1996).

The potential for main effects of high effort and low reward to compromise health status has been acknowledged (Siegrist, 1996). Exerting effort to meet job demands that are chronically high is likely to deplete mental and physical energy and impair health over time, whereas rewards could be considered resources that benefit wellbeing regardless of the expenditure of effort. Some studies have supported the main effects of efforts and rewards on health-related

outcomes (e.g. Gorgievski, Van der Heijden, & Bakker, 2018; Preckel, Meinel, Kudielka, Haug, & Fischer, 2007; Van Vegchel, De Jonge, & Bosma & Schaufeli, 2005). The negative effects of an effort-reward imbalance are, however, central to the model and high effort/low reward conditions (most frequently represented by a ratio of efforts to rewards) have been found to increase the risk of health problems (Hasselhorn, Tackenberg, & Peter, 2013; Siegrist, 2012). More specifically, cross-sectional and longitudinal studies have associated a high ERI with mental health symptoms such as depression, anxiety and emotional exhaustion, as well as other outcomes such as substance misuse (Godin, Kittel, Coppieters, & Siegrist, 2005; Griffin, Greiner, Stansfeld, et al. 2007; Niedhammer, Chastang, David, Barouhiel, & Barrandon, 2013; Siegrist, 2012; Violanti, et al. 2018). Strong positive relationships have also been found between an ERI and physical health complaints ranging from minor psychosomatic symptoms and fatigue to more serious disorders such as cardiovascular disease (Chandola, Siegrist, & Marmot, 2005; Fahlen, Knutsson, Peter, & Akerstedt, 2006; Niedhammer, Tek, Starke, & Shimazu, & de Jonge, 2004; Siegrist, 2012).

Although high efforts and low rewards are established risk factors for employee health, evidence for the explanatory power of overcommitment is less consistent (see van Vegchel et al. 2005 for a review). Some studies have found that overcommitted workers report poorer health regardless of the presence of high effort/low reward conditions (e.g. Feldt et al. 2013; Preckel et al. 2007; Tse, Flin, & Mearns, 2007) With few exceptions, however, support for the interactive effects of ERI and overcommitment on the wellbeing of employees is lacking (Kinman, & Jones, 2008a,b; Lehr,Koch, & Hillert, 2013; Preckel, et al. 2007). Based on a systematic review of 51 studies, Siegrist and Li (2016) concluded that overcommitment has an independent explanatory role in predicting health, but they recommended that future research should explore the interaction hypothesis further. The current study responds to this

call by testing the main and multiplicatory effects of efforts, rewards and overcommitment on mental and physical health status in a sample of academic employees. The role played by rewards from different sources is considered.

The ERI model specifies that rewards are transmitted by three systems: a) promotion and financial remuneration; b) esteem, approval and respect; and c) career rewards such as job security. Nonetheless, with few exceptions, studies testing the model have used an aggregate measure of rewards. While the psychometric validity of this approach is supported (see Siegrist et al. 2004), the effects of the reward systems, both separately and in combination with efforts, cannot be established. The value of considering the three reward types independently has been supported by a study of Dutch healthcare workers that favoured a five-factor solution (i.e. efforts, financial, esteem and job security rewards and overcommitment) over the use of a composite measure of rewards (de Jonge, van der Linden, Schaufeli, Peter, & Siegrist, 2008).

The limitations of conceptualising job demands and resources without consideration of context are widely acknowledged and recent models of work-related stress, such as the Job Demands-Resources model, recognise the importance of specificity (Bakker & Demerouti, 2007). It could therefore be argued that examining the contributions made by the three reward systems independently has greater potential to inform targeted interventions to improve wellbeing in different organisational settings. Although studies of blue-collar, white-collar and professional employees in several countries have highlighted the negative effects of high effort-low reward conditions (see Siegrist, 2012 and van Vegchel et al. 2005), the rewards most likely to counterbalance efforts may vary according to occupational status and working

conditions (Tsutsumi & Kawakami, 2004). For example, poorly paid and precarious employment can threaten health, but the curvilinear associations between both salary and job security and wellbeing imply that an increase in these extrinsic rewards is of no additional benefit beyond a set point (Kahneman, & Deaton, 2010; Warr, 1987). For relatively well-paid and secure professionals, therefore, intrinsic reward systems such as esteem and respect may be more powerful.

The two studies that have previously tested the independent effects of the ERI reward systems have yielded interesting findings that warrant further investigation. A study of healthcare workers conducted by van Vegchel, et al. (2002) found that a combination of high efforts and low esteem rewards had the strongest effects on psychosomatic symptoms and fatigue, whereas an imbalance between efforts and career rewards posed the greatest risk for physical health. The main and interactive effects of overcommitment were not examined in this study. The relevance of esteem rewards to the wellbeing of employees in the 'helping' professions was also highlighted in a case-controlled study of schoolteachers, whereby lack of recognition and respect from supervisors or colleagues had more beneficial effects on objectively-defined depressive symptoms than salary or career rewards (Lehr et al. 2013). Overcommitment was not found to be an independent risk factor for depression, but its interactive effects were not tested. The findings of these studies suggest that there is value of considering the different reward systems in the ERI model independently and further examine the role played by overcommitment. The present study, therefore, examines the main and interactive effects of extrinsic efforts and the three reward systems on mental and physical health over time, together with the main and interactive effects of overcommitment. Based on the studies reviewed above, esteem rewards may have particularly powerful effects on health status among academic staff. As discussed in the next section, we also anticipate that

overcommitment, as a marker of high involvement and engagement in work, would have particularly strong effects on the health of participants.

There are several reasons why an extended ERI is an appropriate framework for examining work-related stress in academic employees. It has been estimated that between 10 and 40 percent of the general workforce experience some degree of ERI, but people employed in jobs requiring strong intrinsic motivation may be particularly sensitive to conditions of inequity (Siegrist, 2001). Reflecting the basic premise of the ERI model, previous research has demonstrated the importance of equity and justice for the wellbeing of academic employees (Bilge, 2006; Gillespie, Walsh, Winefield, & Stough, 2001; Kinman, & Jones, 2004; Pignata, Winefield, Provis, & Boyd, 2016). Although poor salary, lack of promotion opportunities and job insecurity have also been strongly related to reports of stress and dissatisfaction among academic staff (Fontinha, van Laar, & Easton, 2016; Tytherleigh, Jacobs, Webb, Ricketts, & Cooper, 2007), they appear to be more strongly motivated by intellectual stimulation, recognition of expertise and opportunities to use their initiative (Gillespie et al. 2001; Kinman, 2014; Waltman, Bergom, Hollenshead, Miller, & August, 2012; Winter, & Sarros, 2002). Accordingly, esteem rewards may have more powerful effects on the wellbeing of academics than job security and career prospects.

Overcommitment may also be particularly relevant to the wellbeing of academic employees. Previous research has found high job involvement, a profound identification with the job and a drive to work excessively among academics, who operate within a culture where long hours and a poor work-life balance are typically normalised (e.g. Hogan, Hogan, Hodgins, Kinman, & Bunting, 2016; Kinman, 2016). Under such conditions, therefore, overcommitment may

be encouraged and reinforced and, over time, this may have negative implications for health. Strong main effects of overcommitment on mental and physical health are therefore anticipated and it may also exacerbate the impact of combinations of efforts and reward systems.

Variables included in the ERI model have previously been tested cross-sectionally in a sample of academic employees using an aggregate measure of rewards (Kinman, & Jones, 2008a). The independent effects of high efforts, low rewards and high overcommitment and a two-way interaction between efforts and rewards predicted psychological distress, whereas the main effects of efforts, rewards and overcommitment explained physical health symptoms. Although these findings highlighted the relevance of high efforts and low rewards to the wellbeing of academics and the additional risks of being overcommitted to the job role, an assessment of the main and interactive effects of the three reward systems over time has greater potential to highlight associations and shape interventions to improve wellbeing in the sector.

Aims

This study utilises a prospective design to examine the main and interactive effects of job-related efforts and the three reward systems within the ERI model, together with the main and indirect effects of overcommitment, in predicting health outcomes in academic employees. Several hypotheses are examined:

1. Efforts will be positively related to strain (i.e. mental and physical health symptoms)

2. Rewards (the three systems independently) will be negatively related to strain
3. The extrinsic ERI hypothesis: an imbalance between efforts and rewards will be positively associated with strain;
4. The intrinsic ERI hypothesis: overcommitment will be positively associated with strain
5. The interaction hypothesis: extrinsic effort-reward imbalance and a high level of intrinsic overcommitment will intensify the risks to employee health.

Method

Data collection and sample

Data were collected via an online questionnaire. Invitations to participate were sent by e-mail to 2,400 academics working on a full-time basis in teaching and research roles in UK Universities and 649 responded at Time 1. Participants were asked to provide a unique code at Time 1 which was requested at follow-up to match the data. Matched data were obtained for 458 staff approximately 14 months later and this sub-group formed the sample for the current study. Demographic differences between participants who completed the questionnaire at both time points were compared with those who did not provide participate at Time 2. No significant differences were found in age, gender and length of employment. The research was approved by the ethics committee of the author's institution. Participants' confidentiality and anonymity were assured.

Sixty per cent of the sample was male and the majority (71 percent) was over 40 years old. Sixty-seven percent had been employed in the university sector in the UK for at least 10 years, and 40 per cent had done so for 20 years or more. The demographic characteristics of

the sample generally corresponded to the wider population of academics in the UK at the time the baseline data were collected (HESA, 2014), but male participants were slightly over-represented.

Measures

Background variables

Age and gender were control variables.

Baseline predictors (Time 1)

Effort-reward imbalance and overcommitment

Scales from the ERI questionnaire (Siegrist, 2012) measured job-related efforts, rewards and overcommitment. These scales have high internal and predictive validity (Siegrist, et al. 2004). A six-item measure of effort was used, e.g. "I have constant time pressure due to a heavy workload." (α = .84). Eleven items measured the three rewards systems: the availability of promotion prospects (4 items); esteem and support from colleagues and managers (5 items) and job security (2 items): for example, "Considering all my efforts and achievements, my job promotion prospects are adequate." and "My job security is poor" (α = promotion = .81; esteem = .82; security = .86). All items were rated on a four-point scale where 1 = "strongly disagree" and 4 = "strongly agree". Items from the effort and the three individual reward subscales were summed with higher scores representing more efforts and rewards. A score for the composite rewards scale was also calculated to facilitate comparisons with published norms (α = .88).

Overcommitment was measured with six items: e.g. “People close to me say I sacrifice too much for my job.” Items were rated on a four-point scale where 1 = “strongly disagree” and 4 = “strongly agree”. A mean score was taken across items (α = .84).

Outcome measures (Time 2)

Mental health

The General Health Questionnaire (GHQ-12: Goldberg, & Williams, 1988) assessed symptoms of depression, anxiety and cognitive difficulties. This is a widely-used screening device for identifying minor psychiatric disorders (see Goodwin et al. 2013). The GHQ-12 assesses. An example of an item is: “Have you recently been able to enjoy your normal day to day activities?”, where responses are requested on a four-point scale ranging from 0 “much more than usual” to 3 = “more less than usual.” Likert scoring was used, where mean scores were taken across items. Higher scores represent poorer mental health. (α = .92).

Physical health

Respondents assessed their physical health status using a five-point scale where 1 = “very good” and 5 = “very poor”. Single item measures of health and work-related stress symptoms are commonly used in cohort studies and large-scale surveys and are considered to have acceptable validity (Bowling, 2004, Elo, Leppanen, & Jahkola, 2003).

Data analysis

The recommended formulation of effort-reward imbalance was used, where a ratio was computed by dividing the total effort score with the reward score and multiplying with a correction factor to compensate for the unequal number of items in the scales (Siegrist & Peter, 1996). Values beyond 1.0 indicate an effort-reward imbalance. Separate ratios were computed for each of the three reward systems and used as continuous variables in the correlation and regression analysis.

Hierarchical regression analysis was used to identify the significant predictors of the outcome variables (i.e. mental and physical health) measured at Time 2. Gender and age were entered in the first step to control for their potential effects. At step 2, extrinsic efforts, the three reward subscales and overcommitment were entered simultaneously to examine their main effects on the two outcome variables. At step 3, the three effort/reward ratios (i.e. efforts combined with promotion, esteem and security rewards) were entered to establish whether an imbalance predicted outcomes over and above the effects of efforts and rewards independently. In the fourth and final step, the two-way interaction terms effort/reward ratios x overcommitment were entered to establish whether this intensified the risk to mental and physical health over time.

Results

Table 1 shows the descriptive data for extrinsic efforts, rewards (composite rewards and those relating to salary, esteem and security), the ratio for efforts and total rewards and the three effort/reward ratios, overcommitment, and mental and physical health. Scores for extrinsic effort and composite rewards scale generally corresponded with published norms that have

used the same items and scoring, but the mean score for overcommitment was somewhat higher than that found in previous studies (Lehr, et al. 2010; Li & Siegrist, 2013). As described above, an effort-reward imbalance is indicated where the ratio is equivalent to, or exceeds, 1.0. In the current sample, 26% had an imbalance between extrinsic efforts and esteem rewards, 32% an imbalance between efforts and career rewards and 26% an imbalance between efforts and salary rewards.

Correlations between study variables are also shown in Table 1. Significant positive relationships were found between extrinsic efforts (r = .53, p <.001), all three reward systems (promotion rewards, r = -.35, p <.001; esteem rewards, r = -.54, p <.001 and security rewards, r = -.46, p <.001), overcommitment (r = .59, p <.001) and mental health symptoms measured at Time 2. Although the ERI variables were also significantly related to physical health symptoms, the relationships tended to be somewhat weaker: extrinsic efforts (r = .44, p <.001); promotion rewards (r = -.28, p <.001); esteem rewards (r = -.33, p <.001); security rewards (r = -.33, p <.001) and overcommitment (r = .46, p <.001).

TABLE 1 ABOUT HERE

The main and interactive effects of job-related efforts, the three reward systems and overcommitment (independently and combined) were examined using hierarchical multiple regression analysis (see Table 2). The model accounted for a total of 43% of the variance in self-reported mental health symptoms assessed at Time 2 (R^2 =.44, F(13,424)=21.51, p <.001) which was explained by the main effects of efforts (β = .22, p<.001), esteem rewards (β = -.18, p<.001), career rewards (β = -.12, p<.01) and overcommitment (β = .24, p<.001).

The ratio between efforts and esteem rewards entered in step 3 was also significant (β = .34, $p<.01$). No contribution to the incremental variance was made by the other effort-reward ratios, or their two-way interactions with overcommitment. For physical health symptoms, a total of 30% of the variance was explained (R^2 =.32, $F(13,424)=12.37$, $p<.001$) by the main effects of efforts (β = .15, $p<.01$), security rewards (β = -.15, $p<.01$) and overcommitment (β = .29, $p<.001$). No contribution to the variance was made by the two other reward systems, the effort-reward ratios or the interactions with overcommitment.

Hypotheses, that efforts will predict mental and physical health symptoms was supported. Partial support was obtained for hypothesis 2 as, although esteem and security rewards were negative predictors of mental health symptoms, only security rewards were significantly related to physical health symptoms. Limited support was found for the extrinsic ERI hypotheses (hypothesis 3), as the ratio between efforts and esteem rewards made the only significant contribution to the variance in mental health symptoms. The intrinsic ERI hypothesis (hypothesis 4) was fully supported, as strong positive associations were observed between overcommitment and both health outcomes. Finally, no support was found for hypothesis 5, as the interactions between the three effort-reward ratios and overcommitment failed to contribute to the incremental variance.

TABLE 2 ABOUT HERE

Discussion

This study examined the main and interactive effects of efforts, rewards and overcommitment in predicting mental and physical health status in academic employees measured over one year later. The relevance of extrinsic and intrinsic effort in this context and the value of examining the contributions made by the three reward transmitter systems independently was confirmed. In accordance with the findings of previous studies conducted in different occupational settings (e.g. Gorgievski et al. 2018; Niedhammer et al. 2003; Van Vegchel et al. 2005), perceptions of high effort and low rewards at work were found to threaten health status. Academics who indicated that they put more effort into their work and who were more overcommitted to the job role tended to report poorer mental and physical health. As anticipated, the effects of the three reward systems on wellbeing were not equivalent. Evidence was found that low esteem and security rewards were risk factors for mental health and low security rewards threatened physical health status. Particularly strong evidence emerged for the benefits of esteem rewards, in that academics who believed that they received more esteem and respect from managers and co-workers typically reported better mental health. This concurs with the findings of previous research that has highlighted the importance of academics gaining sufficient recognition for their knowledge and expertise (Winter & Sarros, 2002).

The findings support previous studies suggesting that extrinsic working conditions are less important for the wellbeing of academic employees than more intrinsic aspects (Gillespie et al. 2001; Kinman & Wray, 2016). Although promotion rewards, encompassing opportunities for advancement and financial remuneration, had no significant effects on mental or physical health status over the study period, job security was related to both health outcomes. The

university sector in the UK has experienced major reorganisation in recent times and voluntary and compulsory redundancies have become increasingly common. The negative consequences of insecure work on the mental health of non-tenured academic staff in particular has been highlighted (Reevy, & Deason, 2014). In the current study, the sample utilised were mainly employed on a permanent basis. As the number of academics in the UK that are working on fixed-term or casual contracts is increasing (HESA, 2018), future research should test the expanded ERI model with a more representative sample of staff to explore the relative impact of 'objective' and more 'subjective' forms of job insecurity in the sector.

In accordance with previous studies (e.g. Feldt et al. 2013), overcommitment was an independent risk factor for health. These findings indicate that excessive striving at work, combined with an intrinsic need for approval and esteem from others, can threaten the mental and physical functioning of academics. Previous research has found that academics who are more overcommitted to the job typically have a poorer work-life balance (Kinman, & Jones, 2008). A recent study conducted by Hinsch, Spanier, Radoschewski, & Belthge, (2018) found that overcommitment mediated the relationship between ERI and mental health symptoms. The authors suggest that this effect could be explained by overcommitment reducing opportunities to detach physically and psychologically from work-related problems. Daily diary research would help elucidate the mechanisms through which overcommitment influences health status over time. Particular focus could be placed on working hours and patterns, as well as work/non-work boundary management strategies and recovery processes, as they might mediate or moderate the negative effects of overcommitment on health (Hogan et al. 2014; Kinman & Jones, 2008b).

There was some evidence that an imbalance between efforts and esteem rewards can increase the risk of mental health problems, supporting previous findings (van Vegchel et al. 2002) and further highlighting the importance of rewards from this source. Nonetheless, high effort and low reward conditions (from any of the three sources) did not amplify the negative effects of overcommitment. It is likely, however, that the high potential for role overload and conflict previously found among samples of university staff (Kinman, & Wray, 2015; Winefield, et al. 2008) means that any rewards related to promotion and job security are insufficient to offset the high level of effort expected across different areas of work.

The extent of ERI and overcommitment found in this study gives some cause for concern for the wellbeing of academic employees. The ratio of efforts to rewards and the mean level of overcommitment exceeded the cut-off points that have been found to discriminate between mentally healthy and unhealthy individuals (Lehr et al. 2010). There is a need, therefore, to design, implement and evaluate interventions to restore the balance between efforts expended and rewards received, particularly in relation to esteem and job security, and to reduce overcommitment to the job role. Although the ERI model has strong potential to shape interventions to improve wellbeing at the level of the individual, the organisation and the sector, few studies have yet been conducted. It has been recognised that action research techniques and other participatory approaches can help shape practical, low-cost interventions, by enabling employees to identify options to reduce efforts and enhance rewards via different distribution systems (Aust, Peter, & Siegrist, 1997).

The rapid intensification and diversification of academic work documented in several countries (Kinman, & Wray, 2016), suggests that initiatives aiming to reduce the level and range of demands would be particularly effective in improving wellbeing. The success of such initiatives will, however, depend on identifying the aspects of the academic role that are perceived to be the most threatening and how they might be minimised. There is evidence that stressors linked to one's professional identity are particularly harmful to wellbeing. The risk of strain increases if an employee believes their identity has been devalued, or if their work tasks are not well aligned with those appropriate to their role (Semmer et al. 2007). Recent research findings suggest that academics regularly perform tasks they consider to be illegitimate and unreasonable which is a key source of strain (Kinman & Wray, 2014; Opstrup & Pihl-Thingvad, 2016). Further insight is needed into the aspects of their work that academic employees consider congruent and incongruent with their professional role and the rewards that might counterbalance the effects of perceived illegitimacy on wellbeing, engagement and job performance over time.

As well as reducing demands, interventions are required to restore perceptions of equity between efforts expended and rewards gained. The findings of this study suggest that initiatives that aim to enhance perceptions of esteem and respect from colleagues and managers may help protect the wellbeing of academic employees. Receiving respect and approval from others may be particularly important in preserving self-esteem under current conditions where the quality and value of teaching and research is subject to intense scrutiny. Feeling valued by one's organisation is not only important for wellbeing, but vital for other key outcomes such as commitment, job performance and retention (Pignata et al. 2014). Although the findings of the current study show that respect from others may be particularly important for the ongoing health of academics, future research using the ERI framework

could examine the effects of more job-specific rewards such as academic freedom, peer and public recognition, intellectual stimulation, research collaborations with colleagues, writing and publishing research papers, enjoyment of teaching, and good relationships and rapport with students (Gillespie et al. 2001; Grantiz, Koernig, & Harich, 2009; Kinman, 2014). Whether these factors offset the negative effects of job-related efforts on wellbeing should also be examined. Conservation of Resources theory (Hobfoll, 1989) might be a useful framework through which to explore organisational reward systems. The rewards that academics value most highly could be initially examined, together with the ways in which they use certain rewards to protect themselves against the lack or loss of others and help them expand their reward systems in the future.

The findings of this study strongly suggest that interventions that seek to modify overcommitment are likely to improve the wellbeing of academics. Nonetheless, this may be challenging in a culture where long working hours and a deep identification with the job role are expected and work is central to identity and self-esteem. Little is yet known about the extent to which overcommitment is stable or modifiable (du Prel et al. 2015), but initiatives that seek to highlight the potentially damaging effects of overcommitment and help employees improve their boundary management skills and increase opportunities for recovery from work might be particularly helpful. Chen (2016) suggests that cognitive-behavioural therapy might help reduce overcommitment by modifying stress appraisals reducing over-identification with the job role. There is also growing evidence that mindfulness may be particularly effective in helping employees decrease ruminative thinking about work and building flexibility and emotional resilience (Hulsheger, Alberts, Feinholdt, & Lang, 2013). Mindfulness training may therefore help overcommitted employees reduce the need to be

approved of and esteemed by others and help them decrease their investment in their work both physically and emotionally.

This study has strengths and limitations. It obtained data from a fairly large sample of UK academic employees and the use of validated measures allow comparison of results. Nonetheless, the findings should be interpreted with caution until they are validated with more nationally representative samples that include a higher proportion of temporary and casual workers. Although mental and physical health were assessed using validated scales, self-report measures are subject to bias. More objective indicators of health from an external source would offer a more valid test of the effects of an effort-reward imbalance on wellbeing. A single item was used to assess physical health; although such measures have limitations, they are generally considered reliable and have strong concurrent and discriminant scale performance with established measures of health status and health-related outcomes such as doctors' visits (Bowling, 2004; De Salvo et al. 2006).

The longitudinal effects of efforts, rewards and overcommitment on health cannot be established due to the limitations of the study design. Measures of health were only taken at follow up, so it was not possible to control for them at baseline. Several studies conducted with large samples of UK academics over the last decade, however, have found that work-related demands and mental health symptoms are chronically high (Kinman et al. 2006; Kinman & Wray, 2016), so the sample may not be sensitive to what might only be minor changes in working conditions. The mean score on the measure of mental health symptoms used in this study was higher than published norms (Stride, Wall, and Catley, 2007), meaning that focusing on academics who were more mentally healthy would be problematic.

Nonetheless, it is recognised that academics who were experiencing poor health might believe that they put more effort into work, perceive fewer rewards and be more over-committed to the job role. Future research should utilise a full panel design to test causal hypotheses based on the findings of the present study and test for reciprocal causation.

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TABLE 1: Descriptive data and correlations between efforts, rewards, effort-reward ratios, overcommitment (T1) and study outcomes (T2)

	Score/mean (SD)	1	2	3	4	5	6	7	8	9	10	11	12
1. T1 Efforts	11.10 (3.82)	.00											
2. T1 Total rewards	28.16 (8.53)	-.55***	.00										
3. T1 Promotion rewards	10.92 (3.75)	-.35***	.84***	.00									
4. T1 Esteem rewards	11.56 (4.03)	-.54***	.89***	.62***	.00								
5. T1 Security rewards	5.68 (2.64)	-.46***	.68***	.35***	.46***	.00							
6. T1 Overcommitment	2.80 (0.59)	.59***	-.37***	-.24***	-.38***	-.29***	.00						
7. Effort/reward ratio	0.81 (0.61)	.81***	-.82***	-.64***	-.75***	-.60***	.47***	.00					
8. Effort/promotion ratio	0.85 (0.64)	.72***	-.79***	-.78***	-.64***	-.45***	.42***	.92***	.00				
9. Effort/esteem ratio	0.85 (0.72	.78***	-.76***	-.51***	-.82***	-.47***	.45***	.92***	.78***	.00			
10. Effort/security ratio	1.01 (0.91)	.76***	-.71***	-.41***	-.56***	-.85***	.43***	.83***	.67***	.71***	.00		
11. T2 Mental ill health	1.22 (0.50)	.53***	-.51***	-.35***	-.49***	-.39***	.48***	.53***	.47***	.53***	.50***	.00	
12. T2 Physical ill health	2.49 (1.11)	.44***	-.38***	-.28***	-.33***	-.33***	.46***	.41***	.36***	.39***	.40***	.41***	.00

Total scores are provided for efforts, rewards and ratios and mean scores for overcommitment, mental and physical ill health

One-tailed correlations: ***p < .001.

TABLE 2: Hierarchical multiple regression analyses of ERI variables predicting study outcomes

	Dependent variable			
	Mental health symptoms		Physical health symptoms	
Predictor	ΔR^2	β	ΔR^2	β
Step 1	.00		.02*	
Gender		.06		.09
Age		-.01		-.09
Step 2	.39***		.27***	
Efforts		.22***		.15**
Promotion rewards		-.06		-.09
Esteem rewards		-.18***		-.01
Security rewards		-.12**		-.15**
Overcommitment		.24***		.29***
Step 3	.03**		.01	
ERI ratio/promotion		-.10		.16
ERI ratio/esteem		.34**		.18
ERI ratio/security		.07		.19
Step 4	.01		.00	
ERI ratio/promotion X overcom		.01		.04
ERI ratio/esteem X overcom		.02		.39
ERI ratio/security X overcom		.02		-.73
Total R^2	.43		.30	

p < .05; **p < .01; ***p < .001.