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Does job crafting affect employee outcomes via job characteristics? A meta-analytic test of a key job crafting mechanism

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Abstract

Job crafting refers to the self-initiated work behaviours employees use to change their job characteristics. According to job design theory, these crafting-induced changes in job characteristics should impact employee outcomes. Job characteristics can therefore be proposed as a *key* mechanism through which job crafting affects employee outcomes and we present cross-sectional meta-analytic structural equation modelling of this key mechanism ($K = 58$ independent samples, $N = 20{,}347$ employees). Results show significant indirect effects between task resource crafting and employee outcomes (well-being and positive job attitudes) via task resources, and significant indirect effects between social job crafting and employee outcomes (well-being and positive job attitudes) via social resources. Results also indicated that challenge and hindrance demand crafting increase job strain via increases in job demand. Overall, our findings indicate that job characteristics are an important job crafting mechanism, that employees may have difficulty in crafting job demands in ways that produce beneficial outcomes, and that future research needs to consider simultaneously the range of mechanisms through which job crafting affects outcomes.

KEYWORDS
job characteristics, job crafting, meta-analysis, performance, strain, well-being

INTRODUCTION

Job crafting can be broadly defined as self-initiated work behaviours that employees use to change the characteristics of their job. For example, an employee might take on new tasks to gain greater control over their job, seek out new colleagues to improve social support, or remove technological constraints to lower job demands (Tims & Bakker, 2010; Wrzesniewski & Dutton, 2001). Job crafting theories propose that employees craft changes in job characteristics to secure personally beneficial outcomes such as better well-being and task performance (Bruning & Campion, 2018) and job design theories indicate that these crafting-induced changes in job characteristics will directly affect employee outcomes (Parker, 2014). Job characteristics can therefore be proposed as a key mechanism through which job crafting shapes employee outcomes.

However, only a handful of studies on job crafting have directly tested this key 'job characteristics' mechanism and the evidence from these studies is mixed, with no consistent pattern of indirect effects emerging (e.g., Tims, Bakker, & Derks, 2013). This means that our understanding of this mechanism is unclear and incomplete. As such, the main aim of this paper is to synthesise and integrate the existing empirical literature on this core job crafting mechanism by conducting a meta-analysis of data drawn from job crafting research. In particular, because job crafting theories propose different types of job crafting, with each type of job crafting targeting change in a specific set of job characteristics, we examine whether different types of job crafting primarily affect employee outcomes through specific sets of job characteristics.

This paper makes two significant contributions to our theoretical and empirical understanding of job crafting. First, by synthesising and integrating findings from previous studies of job crafting, we provide greater theoretical and empirical clarity on a job crafting mechanism central to job crafting theory. Second, by providing new insights on the fidelity of job crafting strategies, we provide a more complete and comprehensive understanding of the relationships between job crafting strategies, job characteristics and employee outcomes, particularly with regard to job characteristics as a mechanism that links job crafting to employee outcomes. Importantly, our findings go beyond those of previous job crafting meta-analyses as these either fail to include job characteristics (e.g., Boehnlein & Baum, 2020; Frederick & VanderWeele, 2020; Lichtenthaler & Fischbach, 2019; Oprea et al., 2019) or are partial in their coverage of the relationship between job crafting and job characteristics. The latter includes Rudolph et al. (2017) who examined job crafting strategies in relation to just two job characteristics (autonomy and workload) and Wang, Li, et al., (2020) who examined a global measure of job crafting (promotion focus job crafting) in relation to two job characteristics (colleague support, supervisor support). Our findings also go beyond the insights of previous meta-syntheses and reviews of job crafting. These either fail to address job characteristics or focus on job characteristics as antecedents or moderators of job crafting but not as a mechanism through which job crafting shapes employee outcomes (e.g., Lazazzara et al., 2020; Tims et al., 2021; Wang et al., 2016; Zhang & Parker, 2019). A more thorough understanding of job crafting mechanisms is particularly important at this point in time because of the need to establish a firm theoretical basis to the growing job crafting literature, to job crafting interventions, and to the practical advice on job crafting that is being disseminated.

BACKGROUND AND HYPOTHESES

Conceptualising job crafting

Currently, there are three types of job crafting model: role-based (Wrzesniewski & Dutton, 2001), resource-based (Tims et al., 2012) and approach-avoidance based (Bruning & Campion, 2018; Lichtenthaler & Fischbach, 2019; Zhang & Parker, 2019). All models share a similar definition of job crafting (i.e., employee-initiated work behaviours that change and improve job characteristics) but offer different theoretical accounts and categorisations of job crafting.

Practitioner Points

- Employees use job crafting strategies to alter job characteristics in order to improve key outcomes, e.g., well-being, performance, positive work attitudes.
- Employees are able to successfully craft better task resources (e.g., job discretion) and social resources (e.g., supervisor support, co-worker support) in ways that improve employee outcomes. However, employees appear to have difficulty crafting job demands (e.g., workload, task obstacles) in ways that result in beneficial outcomes.
- Managers should support employees' job crafting of job resources and demands to ensure that it results in beneficial outcomes.

Role-based models propose that employees are motivated to craft the task, relational and cognitive boundaries of their job role (Wrzesniewski & Dutton, 2001) to help meet personal needs for relatedness, autonomy and competence (Ryan & Deci, 2000). To achieve these changes, employees use three types of job crafting strategy. Task crafting seeks to alter work task boundaries (e.g., by increasing control or increasing the variety of job tasks), relational crafting seeks to change the relational boundaries of the job by altering the quality and quantity of workplace interactions, and cognitive crafting seeks to alter employees' understanding of the job by reappraising the meaning or purpose of job tasks.

Resource-based models propose that employees are motivated to craft their job resources (i.e., aspects of the job that are functional in helping to achieve work goals) and job demands (i.e., aspects of the job that require sustained effort) to achieve a better fit between job characteristics and personal needs (e.g., Tims et al., 2012). Four types of crafting are typically proposed. Structural job resource crafting seeks to increase task resources such as job discretion and task variety. Social job resource crafting seeks to increase social resources in the job, such as social support and feedback from others. Challenge demand crafting seeks to increase challenge demands, i.e., demands that are effortful but appraised as stimulating and motivating because they are linked to valued outcomes such as successful coping and performance (Cavanaugh et al., 2000; Kern, Heissler, et al., 2021). Challenge demands include, for example, workload and problem-solving demands. Lastly, hindrance demand crafting seeks to lower or avoid hindrance demands, i.e., demands perceived as obstacles to work goals (Cavanaugh et al., 2000). Hindrance demands include, for example, task constraints, interpersonal conflict, role conflict, and role ambiguity.

Approach-avoidance models of job crafting assert that job crafting behaviour reflects two major human motives (Bruning & Campion, 2018; Zhang & Parker, 2019). One is an approach motive concerned with the pursuit of desired goals by creating new contexts and/or using expansive behaviours such as seeking new challenges. The other is an avoidance motive concerned with the prevention of undesirable goals by stopping or withdrawing from situations and/or using behaviours that limit effort and challenge (Elliot, 2006). Reflecting these motives, approach crafting is defined as an orientation towards achieving desirable work goals (e.g., meaningful work, well-being) through the expansion of job resources and challenge demands, while avoidance crafting is defined as an orientation towards preventing negative work outcomes (e.g., task failure, high stress) through the avoidance or reduction of job characteristics, particularly hindrance demands.

One advantage of approach-avoidance models is that they enable crafting strategies of role- and resource-based models to be conceptualised as types of approach or avoidance crafting (Lichtenthaler & Fischbach, 2019; Zhang & Parker, 2019). Specifically, task and structural crafting (from role- and resource-based models respectively) can be conceptualized as a type of approach crafting that seeks to expand task resources (e.g., task variety, job discretion) through behaviours such as taking on more varied and skilled tasks or asserting greater control over task procedures and timing (Tims, Bakker, & Derks, 2013; Wrzesniewski & Dutton, 2001). For simplicity, this type of approach crafting can be referred to as *task resource crafting* (see Tables 1 and 2). Similarly, relational and social resource crafting can

TABLE 1 Job crafting typologies.

Role-based models	Resource-based models	Approach-avoidance models	Five types of crafting strategy
Task	Structural resource	Approach	1. Task resource crafting
Relational	Social resource	Approach	2. Social resource crafting
Cognitive		Approach	3. Cognitive resource crafting
	Challenge demand	Approach	4. Challenge demand crafting
	Hindrance demands	Avoidance	5. Hindrance demand crafting

TABLE 2 Types of approach & avoidance crafting.

Type of crafting	Examples of crafting behaviour	Targeted job characteristics
Approach crafting		
Task resource crafting	Taking on more varied tasks Taking greater control over task procedure & timing Changing task organisation & workflow	*Task resources* Task and skill variety Job discretion Task identity Task significance
Social resource crafting	Requesting feedback from colleagues Seeking supportive colleagues Initiative positive interactions Expanding professional network Seek mentoring and coaching	*Social job resources* Feedback Social support
Cognitive resource crafting	Reframing task meaning, significance & purpose	*Task and social job resources* Task and skill variety Job discretion Task identity & significance Social support
Challenge demand crafting	Taking on more complex tasks Taking on more responsibility Seeking developmental and learning opportunities	*Challenge demands* Workload Problem solving demand Job complexity
Avoidance crafting		
Hindrance demand crafting	Removing task constraints Avoiding social contact	*Hindrance demands* Task constraints Interruptions Interpersonal conflicts

be understood as a type of approach crafting that seeks to expand a job's social resources (e.g., feedback, social support) through behaviours such as requesting feedback, seeking supportive colleagues and seeking mentoring. This type of approach crafting can be referred to as *social resource crafting*. In addition, cognitive crafting (from role-based models) can be understood as a type of approach crafting that aims to change one's perceptions of job resources in a positive manner by, for example, reframing the meaning, significance and purpose of task and social resources, while challenge demand crafting (from resource-based models) can be understood as a type of approach crafting that seeks to increase job challenges (e.g., workload, problem solving demand) by taking on more complex tasks and responsibility or seeking developmental opportunities. These types of approach crafting can be referred to as *cognitive resource crafting* and *challenge demand crafting*. Lastly, *hindrance demand crafting* (from resource-based models) can be understood as a type of avoidance crafting that seeks to diminish hindrance demands (e.g., task constraints, interpersonal conflicts) by removing or avoiding such demands.

Conceptualising the job crafting strategies of role- and resource-based models as types of approach and avoidance crafting is advantageous for the purposes of this study, as it allows the data

available for meta-analytic study, which is almost entirely based on role and resource-based models, to be integrated and tested parsimoniously. Crucially, it enables the job characteristics mechanism to be tested (in principle) in a single model with five types of approach and avoidance crafting, rather than in two separate models grounded in either a role-based or resource-based perspective. Consequently, we set our hypotheses in relation to the five types of approach-avoidance crafting outlined above (see Tables 1 and 2).

Job crafting mechanisms: The key role of job characteristics

Job crafting research has proposed a number of mechanisms through which job crafting affects employee outcomes. One is a job characteristics mechanism in which job crafting-induced changes in job characteristics are proposed to have a direct effect on employee outcomes (Tims, Bakker, & Derks, 2013). Given that job crafting is theorised to primarily affect job characteristics, and the considerable theoretical and empirical evidence for the directs effects of job characteristics on employee outcomes, the job characteristics mechanism can be considered as a key job crafting mechanism (Parker, 2014; Parker et al., 2017). It is, however, important to acknowledge that other job crafting mechanisms have been proposed in which job characteristics play a role, notably, a job-person fit mechanism and a need-fulfilment mechanism. In the job-person fit mechanism (Tims et al., 2012), crafting-induced changes in job characteristics increase the fit between job and personal characteristics, and it is the increase in fit that improves employee outcomes (Tims et al., 2016). It implies that there are positive effects when job demands match the person's knowledge, skills and abilities and when job resources match the person's needs, expectations and attitudes. In the needs-fulfilment mechanism (Wrzesniewski & Dutton, 2001), crafting-induced improvements in job characteristics directly meet personal needs (e.g., increases in autonomy fulfil the need for self-determination), which in turn impacts employee outcomes. These models complement rather than compete with each other. The job-person fit and need-fulfilment mechanism imply the job characteristics mechanism but suggest further variables (needs, skills, abilities) would need to be included in our meta-analysis in order to be compared.

Our focus is on the job characteristics mechanism, as it is central to job crafting theory, and there is only sufficient data to meta-analytically test this mechanism. The first part of the job characteristic mechanism is concerned with the direct effects of job crafting on job characteristics which, based on job demands-resources theory, can be categorized as task resources (e.g., job discretion, task variety, task feedback), social job resources (e.g., supervisor support, co-worker support, feedback), job challenge demands (e.g., workload and problem-solving demand) and job hindrance demands (e.g., task obstacles, role conflict and role ambiguity; Bakker & Demerouti, 2007; Van den Broeck et al., 2010). According to job crafting theories, the persistent and sustained use of job crafting behaviours increases the likelihood of meaningful changes in job characteristics (either actual or perceived) becoming embedded and accepted in an employee's everyday practice and hence enduring over time (Bruning & Campion, 2018; Staw & Boettger, 1990). Moreover, there is likely to be a strong alignment between the type of job crafting strategy and type of job characteristic changed. For example, task resource crafting may involve trying to take on more tasks or asserting greater control over the content of work tasks. If persistent and sustained, such crafting behaviours are likely to result in meaningful increases in task resources, such as task variety and task discretion, becoming embedded in an employee's everyday practice. Likewise, social resource crafting that involves persistent attempts to gain more detailed feedback from colleagues and seek out more friendly colleagues is, overtime, likely to result in an enduring increase in social resources such as constructive feedback and social support. Similar scenarios can be envisaged for other types of approach crafting (i.e., cognitive resource crafting, challenge demand crafting) and avoidance crafting. For instance, with regard to hindrance demand crafting, an employee's sustained use of 'work arounds' to remove technological constraints may result in meaningful reductions in hindrance demands (Vogelsmeier et al., 2008).

Research on job crafting provides empirical support for the effects of job crafting on job characteristics. Task resource crafting has been positively associated with task resources such as task discretion (e.g., Rudolph et al., 2017) and task variety. Social resource crafting has been positively associated with social resources such as social support and feedback. Challenge demand crafting has been positively associated with challenge demands such as workload (Rudolph et al., 2017), problem solving demand and job complexity, while hindrance demand crafting has been found to be negatively associated with hindrance demands such as role ambiguity and role conflict. However, some studies find evidence to the contrary, particularly for job demand crafting. For example, studies have reported negative associations between challenge demand crafting and workload and positive associations between hindrance demand crafting and role ambiguity, emotional demands and interpersonal conflict.

The second part of the job crafting mechanism concerns the effects of job characteristics on employee outcomes, and there is considerable empirical and meta-analytical evidence for the effects of task and social resources (Alarcon, 2011; Humphrey et al., 2007; Parker et al., 2017) and challenge and hindrance demands (Gilboa et al., 2008; LePine et al., 2005; Podsakoff et al., 2007) on task performance, employee well-being (i.e., positive affect, engagement), employee strain (i.e., negative affect, burnout) and positive job attitudes (e.g., job satisfaction and commitment). Theoretically, these effects can be explained using job demand-resource theory (Bakker & Demerouti, 2007). According to this theory, task and social resources of a job enable employees to achieve work goals, cope with job demands and meet fundamental needs (e.g., for autonomy, competence and relatedness) and thereby foster task performance, well-being and positive job attitudes, and by that decrease job strain. In contrast, challenge demands deplete energy but stimulate effort 'as they yield the promise of goal achievement and need satisfaction' (Van den Broeck et al., 2010, p. 5) and thereby increase job strain but promote task performance, well-being and positive job attitudes, whereas hindrance demands deplete energy and prevent goal attainment, and as a result increase job strain, lower task performance and well-being, and inhibit positive job attitudes.

In support of the job characteristics mechanism, we have presented theoretical and empirical evidence that approach and avoidance crafting strategies alter specific job characteristics and that these crafting-induced changes in job characteristics should then affect employee outcomes. With regard to approach crafting, the evidence presented indicates that task resource crafting will increase task resources which, in turn, will promote positive employee outcomes (i.e., task performance, employee well-being and positive job attitudes) and reduce job strain. As such, task resource crafting should have positive indirect effects on positive employee outcomes and a negative indirect effect on job strain (Hypothesis 1). A similar pattern of indirect effects can be expected for social resource crafting (Hypothesis 2) and cognitive resource crafting (Hypothesis 3). In contrast, challenge demand crafting should increase challenge demands which should then promote positive employee outcomes *but* increase job strain. As such, challenge demands crafting should have positive indirect effects on positive employee outcomes *and* job strain (Hypothesis 4). This implies that a positive effect on strain alone is not sufficient to qualify an effect caused by challenge demand crafting. Additional positive effects on well-being, attitudes or performance must be observed. With regard to avoidance job crafting, there is evidence that hindrance demand crafting will reduce hindrance demands which, in turn, should promote positive employee outcomes and reduce job strain. Hindrance demand crafting should therefore have positive indirect effects on positive employee outcomes and a negative indirect effect on job strain (Hypothesis 5).

Only a handful of studies have examined the indirect effects of specific crafting strategies but yield promising support (Tims, Bakker & Derks, 2013). The longitudinal study by Tims, Bakker, and Derks (2013) found that the relationship between task resource crafting and employee outcomes (i.e., work engagement, satisfaction and burnout) was mediated by an increase in task resources, and that the relationship between social resource crafting and these employee outcomes was mediated by an increase in social resources. No indirect effects were found for challenge demand crafting or hindrance demand crafting by Tims, Bakker, and Derks (2013). In addition, a cross-sectional study by Tims et al. found a negative indirect relationship between hindrance demand crafting and disengagement via interpersonal conflict (a hindrance demand), although this was contrary to expectation. We must also note that longitudinal studies of job crafting that include job characteristics are very rare. As such, we could not conduct a meta-analysis on longitudinal

data and had to limit ourselves to the analysis of cross-sectional studies (existing meta-analyses including longitudinal studies do not consider job characteristics, Frederick & VanderWeele, 2020; Lichtenthaler & Fischbach, 2019; Oprea et al., 2019). We are aware that cross-sectional studies only allow limited conclusions about mediation analyses because plausible alternative models cannot usually be ruled out. However, we will show in which cases a job characteristics mechanism is a theoretically possible explanation for empirical data and in which cases such an explanation is not possible.

Based on the theoretical and empirical evidence for the job characteristics mechanism, we set the following hypotheses with regard to approach crafting (Hypotheses 1–4) and avoidance crafting (Hypothesis 5):

> **Hypothesis 1.** Task resource crafting has positive indirect relationships with positive employee outcomes (i.e., task performance, well-being, positive job attitudes) and a negative indirect relationship with job strain that occur via task job resources.

> **Hypothesis 2.** Social resource crafting has positive indirect relationships with positive employee outcomes and a negative indirect relationship with job strain that occur via social job resources.

> **Hypothesis 3.** Cognitive resource crafting has positive indirect relationships with positive employee outcomes and a negative indirect relationship with job strain that occur via job resources.

> **Hypothesis 4.** Challenge demand crafting has positive indirect relationships with positive employee outcomes and job strain that occur via challenge demands.

> **Hypothesis 5.** Hindrance demand crafting has positive indirect relationships with positive employee outcomes and a negative indirect relationship with job strain that occur via hindrance demands.

METHOD

Literature search

We conducted a comprehensive literature review of job crafting research that was completed in July 2022. Relevant articles were identified in PsycINFO, Google Scholar and Scopus databases using the keywords 'job crafting'. We used 2001 as the starting date, as this was the year in which the first paper on job crafting was published (Wrzesniewski & Dutton, 2001). We examined all citations in literature reviews and meta-analyses of job crafting (e.g., Lichtenthaler & Fischbach, 2019; Rudolph et al., 2017; Zhang & Parker, 2019) and, to deal with publication biases, sought to locate unpublished data. For this, we searched for dissertations (in Scopus), sought unpublished data from authors in the field, and reviewed relevant conference programmes (e.g., Academy of Management, European Association of Work and Organizational Psychology). This search returned 2457 sources. Of these, 320 were identified as potentially including empirical data on job crafting, job characteristics and employee outcomes.

Inclusion criteria and study coding

We included sources in the meta-analysis using the following criteria (see Table S1 in Appendix for a full list of search terms and construct classification). (i) Empirical data on the relationships among all three

of the following variables: job crafting, job characteristics, and employee outcomes. Thus, we excluded those that only reported on job crafting and outcomes, and job crafting and job characteristics. (ii) One or more job crafting measures classifiable according to the five dimensions of job crafting specified in our theoretical model, i.e., *task resource crafting* (e.g., task crafting, structural resource crafting), *social resource crafting* (e.g., relational crafting), *cognitive resource crafting*, *challenge demand crafting*, and *hindrance demand crafting (*e.g., hindrance or reducing demands crafting). We therefore included sources developed from role- and resource-based perspectives and studies only using a general job crafting measure were excluded as they could not be used to test study hypotheses. (iii) One or more measures of job characteristics classifiable according to job demands-resources theory, namely, *task job resources* (e.g., job discretion, task variety, task feedback), *social job resources* (e.g., supervisor support, co-worker support, feedback), *job challenge demands* (e.g., workload and problem-solving demand), and *job hindrance demands* (e.g., task obstacles, role conflict and role ambiguity). (iv) One or more measures of *job performance* (e.g., self/other-rated in-role performance or extra-role performance), *positive job attitudes* (e.g., job satisfaction, job commitment), *psychological well-being* (e.g., engagement, happiness), and *job strain* (e.g., burnout, emotional exhaustion). We distinguished between well-being and job strain, as they can relate differently to job demands (Schaufeli et al., 2008).

Second, following recommendations on meta-analytic best practice (Borenstein et al., 2021; Cooper et al., 2009), we included published and unpublished sources such as PhD theses to increase the final sample size and avoid publication bias (McDaniel et al., 2006). Third, to avoid double counting, when the same correlations occurred in more than one source, we included the same relationships only once. Fourth, we included studies in English, Dutch and Spanish. Based on these criteria, our final meta-analytic dataset comprised $K = 54$ sources, representing $K = 58$ independent samples and a total of $N = 20,347$ employees. Fifteen of the independent samples were from unpublished data. Studies included in the meta-analysis are identified with an asterisk in the references.

Our final sample differs from that of other job crafting meta-analyses (Oprea et al., 2019; Rudolph et al., 2017), as it includes studies with relationships among three variables (job crafting, job design, and outcomes) not just two (e.g., job crafting with outcomes) and because we exclude studies only using a general job crafting measure. For example, the meta-analysis by Rudolph et al. (2017) included 114 sources but 95 of these were excluded from our final sample as 60 of their sources did not include any job design variable, 28 sources were unpublished data that we were unable to access, and seven were not included because they either did not report outcome measures or used composite job crafting measures.

The variables of interest were coded from the articles independently by four coders according to the taxonomy described above, e.g., if a particular measure of job crafting found in one paper can be classified into the categories of 'task resource crafting' or 'social resource crafting'. Then, we calculated kappa scores (Cohen, 1968) for each construct in our taxonomy to evaluate the agreement between two scores based on their qualitative judgements of coders regarding different measures tapping into the same construct. *Job crafting*: task resource crafting, $\varkappa = .77$; social resource crafting, $\varkappa = .68$; challenge demand crafting, $\varkappa = .89$; hindrance demand crafting, $\varkappa = 1.00$. *Job characteristics*: task resources, $\varkappa = .91$; social resources, $\varkappa = .80$; challenge demands, $\varkappa = .81$; hindrance demands, $\varkappa = .69$. *Outcomes*: well-being, $\varkappa = 1.00$; job strain, $\varkappa = .77$; performance, $\varkappa = .92$; positive attitudes, $\varkappa = .95$. After this, disagreements were discussed and fixed by the research team. We also retrieved sample size, measure reliabilities and effect sizes. For longitudinal studies ($N = 4$) we only included data from Time 1 and for diary studies ($N = 5$) we only included person-level data. To conduct moderation analyses, the following variables were coded: gender (Mean percentage of females $= 56.1\%$, $SD = 18.93$); age (Mean $= 37.26$, $SD = 7.49$), job tenure in years (Mean $= 9.26$, $SD = 5.3$), published-unpublished articles (75% published) and the type of job crafting scale used. For the latter we distinguished between measures operationalised from role-based models and those operationalized from resource-based models. Measures that operationalised role-based perspectives included those by Slemp and Vella-Brodrick (2013) and Sekiguchi et al. (2017). Measures that operationalised resource-based perspectives were the Tims et al. (2012) job crafting scale or adaptations of it such as Petrou et al. (2012). Seventy six percent of sources were based on resource-based perspectives and used concomitant measures. Furthermore, for task resource crafting, 76% of

sources were based on resource-based perspectives and 24% on role-based perspectives. For social resource crafting, 74% of sources were based on resource-based perspectives and 26% on role-based perspectives.

Meta-analytic procedure

We used meta-analytical (MA) techniques and structural equation modelling (SEM) for hypothesis testing. In addition, a publication bias analysis was conducted (See Appendix S1). Data and code are available https://osf.io/bzdn4/.

Two-stage structural equation model

To test the study hypotheses, we followed the two-stage structural equation modelling (TSSEM) approach described by Cheung (2015a) utilising the R Package 'metaSEM' (Cheung, 2015b). Before pooling the correlations, we corrected each correlation for unreliability using the reliabilities reported in the original studies (Schmidt & Hunter, 2015). For those measures in which reliabilities were unavailable, either because they were not reported or were single item measures, we used a reliability of one, as this approach is more conservative (additional analyses which replaced missing reliabilities with mean reliabilities per scale did not affect results substantively). Furthermore, some studies included multiple job design variables within the same category and to avoid considering studies twice, we combined same category correlations into a single measure depicting the type of job characteristics. For example, Lee et al. included correlations between task resource crafting and two task resources, namely task autonomy and task identity. We therefore combined the correlations to create a single correlation between task resources crafting and task resources. To do this, we first performed a Fisher's Z Transformation on the correlations, averaged the duplicated categories, and then transformed them back into Pearson's r to estimate the model. Fisher's Z transformation provides a less biased estimate of the average correlation than simply averaging the correlation values (Silver & Dunlap, 1987).

Then, in the first stage of TSSEM, the meta-analytic pooled bivariate correlations corrected for unreliability were estimated with maximum likelihood (ML) estimation. We used a random effects model on the assumption that all studies are drawn from different populations due to differences in sample composition, study goals, type of job-crafting conceptualisation and type of organisation where data were collected (Rudolph et al., 2020; Schmidt & Hunter, 2015). The pooled correlation matrix using ML is similar to the well-used sample size weighted average used in many meta-analyses, resulting in a more accurate true score (Schmidt & Hunter, 2015), with the benefit of gaining further information on the relation between the coefficients (namely, the asymptotic covariance matrix of the reliability corrected correlation coefficients, which quantifies the uncertainty of the estimation of each coefficient within the correlation matrix). We report (see Table 3) the pooled reliability-corrected (r_c) and uncorrected (r) correlation, the 95% confidence interval of the pooled reliability-corrected correlation, the I^2 statistic and τ^2. The pooled reliability-corrected correlation is considered statistically significant if the confidence interval does not include zero. The I^2 statistic indicates the proportion of the total variation of the effect sizes that is due to between-study heterogeneity, and τ^2 is an estimate of the variance of the underlying distribution of true effect sizes (Borenstein et al., 2011).

In the second stage, the pooled correlation matrix was used, together with the asymptotic covariance matrix of the averaged coefficients as weight, to estimate SEM models with the weighted least squared (WLS) estimation method (Cheung, 2015a). Advantages of meta-analytic structural equation modelling over bivariate meta-analyses are that it enables more complex models—specifically our hypothesised models of the job crafting mechanism—to be tested while controlling for multicollinearity (Cheung, 2015a). Fitting SEM models using this procedure has three main advantages over other popular methods, such as the univariate method or the general least squares (GLS) method (Cheung, 2015a).

TABLE 3 Approach and avoidance models–bivariate correlations.

Job crafting strategy	Outcomes	K	N	ρ	ρ_c	CI_L	CI_U	I^2	τ^2
Task resource crafting	Task resources	28	8514	.35	.43*	.36	.49	.94	.03
	Social resources	15	3833	.25	.29*	.24	.34	.73	.01
	Challenge demands	15	4757	.12	.15*	.05	.24	.91	.03
	Hindrance demands	16	4715	−.02	−.02	−.09	.05	.84	.02
	Well-being	28	8810	.40	.48*	.41	.55	.95	.03
	Job strain	17	5920	−.14	−.15*	−.24	−.07	.92	.03
	Performance	12	3012	.30	.36*	.27	.45	.91	.02
	Positive attitudes	10	3699	.27	.31*	.23	.39	.86	.01
Social resource crafting	Task resources	35	11,664	.17	.22*	.17	.26	.85	.01
	Social resources	17	5064	.34	.40*	.34	.47	.90	.02
	Challenge demands	22	5865	.13	.16*	.10	.22	.83	.01
	Hindrance demands	20	5406	.08	.11*	.04	.18	.88	.02
	Well-being	32	11,102	.26	.31*	.27	.35	.82	.01
	Job strain	22	7884	−.10	−.11*	−.18	−.05	.87	.02
	Performance	17	4869	.16	.19*	.12	.27	.87	.02
	Positive attitudes	10	3738	.26	.31*	.22	.39	.87	.02
Chall. demand crafting	Task resources	20	5760	.25	.30*	.24	.37	.90	.02
	Social resources	17	4838	.20	.23*	.19	.28	.50	.00
	Challenge demands	13	3578	.12	.15*	.08	.22	.87	.02
	Hindrance demands	22	7788	.06	.09*	.02	.16	.86	.02
	Well-being	26	9528	.33	.38*	.32	.45	.93	.03
	Job strain	16	6430	−.13	−.15*	−.21	−.09	.82	.01
	Performance	16	4820	.24	.28*	.21	.36	.89	.02
	Positive attitudes	2	1045	.21	.24*	.19	.30	.00	.00
Hind. demand crafting	Task resources	20	7376	−.01	−.01	−.08	.05	.84	.02
	Social resources	18	7001	−.01	−.02	−.11	.06	.85	.02
	Challenge demands	11	2872	.06	.08*	.01	.16	.88	.02
	Hindrance demands	19	6328	.09	.12*	.05	.18	.81	.01
	Well-being	23	10,067	−.06	−.08*	−.13	−.02	.85	.02
	Job strain	15	7668	.10	.14*	.02	.25	.95	.05
	Performance	15	4206	.00	−.01	−.10	.08	.89	.02
	Positive attitudes	3	1156	−.08	−.09*	−.14	−.03	.00	.00

Abbreviations: CI_L, lower bound of 95%-confidence interval for the reliability corrected pooled correlation coefficient; CI_U, upper bound of 95%-confidence interval for the reliability corrected pooled correlation coefficient; I^2, amount of variance due to heterogeneity; K, number of studies; N, total pooled sample size; ρ, pooled correlation coefficient; ρ_c, pooled correlation coefficient corrected for unreliability.
*$p < .05$.

First, it uses multi-group SEM to pool the correlation matrix in the first stage. This enables the use of loglikelihood ratios to test the goodness of fit of the pooled correlations as well as the assumption of heterogeneity, while also providing standard errors of each parameter to conduct significance tests and the necessary weight matrix to run models with WLS. Second, the use of WLS effectively solves the issue of selecting the appropriate sample size to estimate the path coefficients by taking into consideration that different paths are usually composed of different sample sizes (Cheung, 2015a). WLS uses the asymptotic covariance matrix to weight each individual correlation, adjusting the degree of precision in the significance test by considering sample size. Furthermore, other meta-SEM techniques

use the pooled correlation matrix as if it were a covariance matrix to run SEM models. This process is also flawed, as covariance matrices carry meaningful information in the diagonal (i.e., variance), while correlation matrices contain uninformative ones in the diagonal. The WLS approach is able to avoid this issue, enabling researchers to effectively use correlation matrices to conduct SEM models (Cheung, 2015a). Finally, fitting a SEM model enables access to the asymptotic covariance matrix of the full model such that a better estimate for the indirect effect can be obtained by Monte Carlo simulations, which shows similar results to typical nonparametric resampling strategies, i.e. bootstrapping (Selig & Preacher, 2008). In our case, we used the online tool developed by Selig and Preacher (2008). This approach is ideal when raw data is unavailable (Preacher & Selig, 2012). To sum up, the TSSEM approach is more precise for estimating the paths of the model, provides standard errors to test the significance of these paths and an asymptotic covariance matrix to estimate the indirect effects.

Hypothesis testing & modelling strategy

To test our hypotheses, we constructed a series of mediation models in three steps. At each step, we increased model complexity. In Step 1, we tested each hypothesis with a 'single IV-single mediator-multiple outcome' model. Such a model produces estimates which only marginally differ from 'single IV-single mediator-single outcome' models, but are more parsimonious with regard to the number of models tested. For example, to test Hypothesis 1, we constructed a model that included task resource crafting (IV), task resources (mediator) and the four correlated outcomes (well-being, job strain, performance and positive job attitudes). These models and all subsequent models include a direct relationship from IV to outcomes. These relations are used to differentiate between full mediation (IV-outcome relation not significant) and partial mediation (IV-outcome relation significant; Aguinis et al., 2017). There were insufficient correlations to test Hypothesis 3 concerning cognitive resource crafting. Thus, Step 1 involved constructing four models (Models 1a–1d) to test Hypotheses 1, 2, 4 and 5.

It is important to mention that Model 1d concerning the indirect effects of hindrance demand crafting on outcomes could not be properly estimated when including positive attitudes as an outcome. This was due to a low number of studies containing the correlation between Hindrance Demand Crafting and positive attitudes. Thus, we estimated Model 1d using only well-being, job strain, and task performance as outcome variables.

In Step 2, we sought to test each hypothesis (H 1, 2, 4 & 5) with a 'single IV-*multiple mediator*-multiple outcome' model. Including multiple mediators accounts for multicollinearity between job characteristics and shows whether the indirect effects of job crafting occur through multiple or 'non-congruent' job characteristics, and thus extends the possible indirect effects compared to Step 1. Step 2 is a test of full versus partial mediation. It could, for example, be that task resource crafting (IV) is partially mediated by task resources, but also partially mediated by social resources. Considering all job characteristics together as mediators might, however, fully mediate the effect of this crafting strategy.

It was not possible to include hindrance demand crafting or hindrance demands in these multiple mediator models, as the low number of correlations with other variables resulted in a non-positive definite T^2 (the heterogeneity covariance matrix representing the heterogeneity of correlations observed in different studies). As such, 'single IV-multiple mediator-multiple outcome' models could only be used to test Hypotheses 1, 2 and 4 and could only include three types of job characteristics, i.e., task resources, social resources and challenge demands. In sum, Step 2 involved constructing three models (Models 2a–2c) for task resource crafting, social resource crafting and challenge demand crafting.

In Step 3, we tested Hypotheses 1, 2 and 4 simultaneously using a '*multiple* IV-multiple mediator-multiple outcome' model (Model 3). This model included all three approach job crafting variables (task resource crafting, social resource crafting, challenge demand crafting—all correlated), three job characteristics (task resources, social resources and challenge demands) and the four outcomes (see Figure 1). The inclusion of multiple job crafting variables accounts for multicollinearity and tests for the robustness of effects and the redundancy among job crafting strategies.
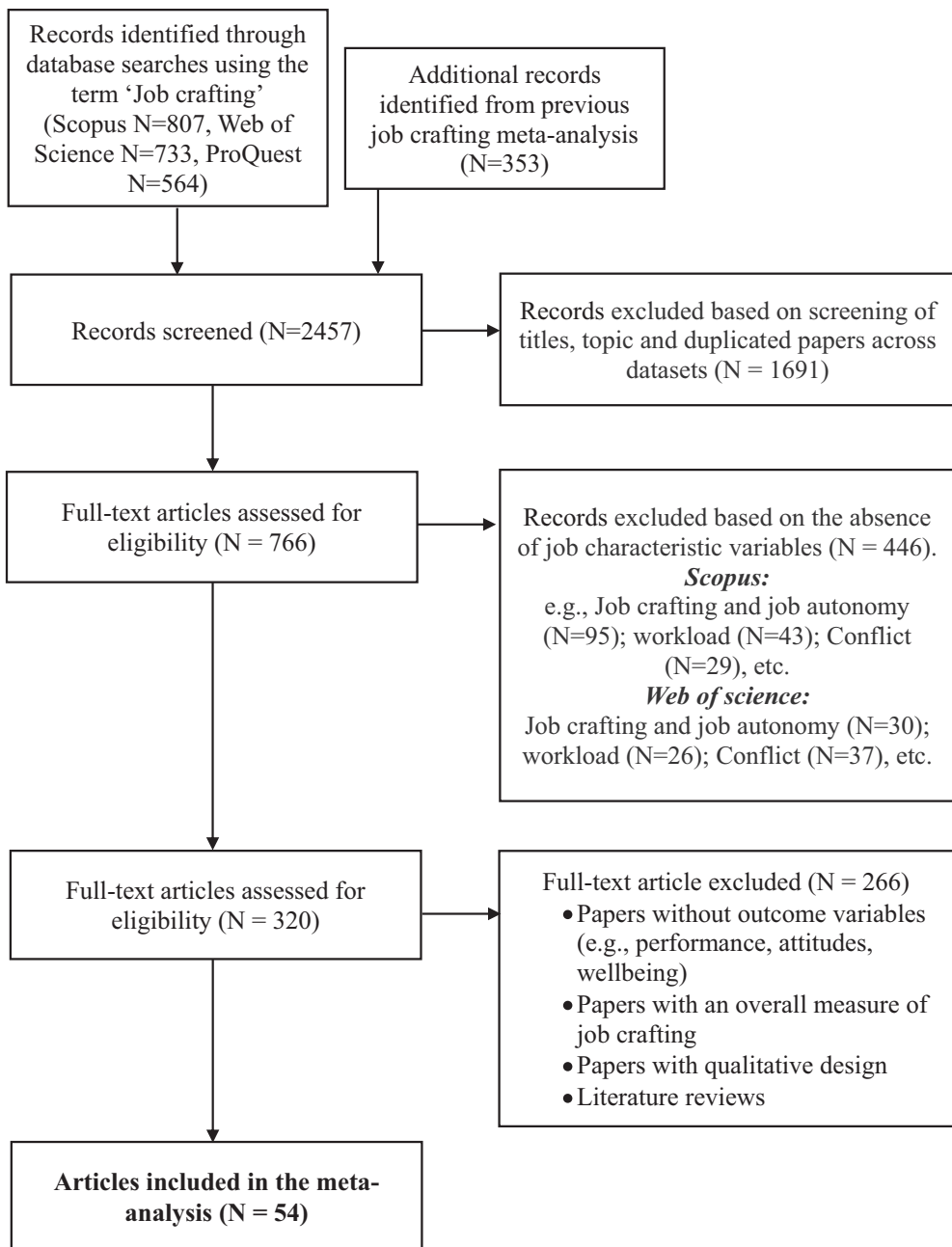
```
┌─────────────────────────┐   ┌─────────────────────────┐
│ Records identified      │   │ Additional records      │
│ through database        │   │ identified from previous│
│ searches using the term │   │ job crafting meta-      │
│ 'Job crafting' (Scopus  │   │ analysis (N=353)        │
│ N=807, Web of Science   │   └─────────────────────────┘
│ N=733, ProQuest N=564)  │
└─────────────────────────┘
```

Records screened (N=2457) → Records excluded based on screening of titles, topic and duplicated papers across datasets (N = 1691)

Full-text articles assessed for eligibility (N = 766) → Records excluded based on the absence of job characteristic variables (N = 446).
Scopus:
e.g., Job crafting and job autonomy (N=95); workload (N=43); Conflict (N=29), etc.
Web of science:
Job crafting and job autonomy (N=30); workload (N=26); Conflict (N=37), etc.

Full-text articles assessed for eligibility (N = 320) → Full-text article excluded (N = 266)
- Papers without outcome variables (e.g., performance, attitudes, wellbeing)
- Papers with an overall measure of job crafting
- Papers with qualitative design
- Literature reviews

Articles included in the meta-analysis (N = 54)

FIGURE 1 Flow diagram of literature search and record selection.

Publication bias analysis

Following the recommendations by Siegel et al. (2022) and Schmidt and Hunter (2015), we conducted a publication bias triangulation using different publication bias analysis methods. Specifically, we used trim-and-fill, Egger's regression, Fail-Safe-N, and the p-curve to examine potential publication bias in all the correlations included in this study. More detail on our approach is contained in the Appendix S1.

RESULTS

Bivariate relationships

Table 3 shows the bivariate results for the key variables (with all bivariate correlations found in Table S2). Focusing on key relationships between job crafting and job characteristics, our results show significant relationships between task crafting and task resources ($\rho_c = .43$, [.36; .49]), social crafting and social resources ($\rho_c = .40$, [.34; .47]), challenge crafting and challenge demands ($\rho_c = .15$, [.08; .22]) and hindrance crafting with hindrance demands ($\rho_c = .12$, [.05; .18]). Table 3 also shows that in most cases the I^2 was larger than 75%, indicating a high degree of heterogeneity (cf. Borenstein et al., 2017) in the bivariate relationships, justifying the use of a random effects model.

Table 4 provides further detail on the relationship between job crafting strategies and the individual job characteristics within each category of job characteristic. With regard to job resources, Table 4 shows that the majority of correlations for task resource crafting were with job discretion ($K = 26$, $\varrho_c = .42$, [.35; .50]) and for social resource crafting most correlations were with social support ($K = 14$, $\varrho_c = .48$, [.41; .55]). With regard to job demands, the majority of correlations for challenge demand crafting were

TABLE 4 Bivariate correlations between job crafting and job characteristics.

Job crafting	Job characteristics	K	N	ρ	ρ_c	CI_L	CI_U	I^2	τ^2
Task resource crafting	*Task resources*								
	Job discretion	26	8188	.35	.42*	.35	.50	.94	.03
	Developmental opportunities	3	498	.49	.61*	.44	.78	.85	.02
	Task variety	1	254	.42	.54*				
	Task identity	1	195	.33	.42*				
	Task feedback	1	75	.28	.35*				
Social resource crafting	*Social resources*								
	Social support	14	4397	.39	.48*	.41	.55	.84	.01
	Feedback from others	3	211	.21	.28*	.16	.41	.00	.00
	Supervisor support	3	846	.32	.36*	.10	.63	.95	.05
Chall. demand crafting	*Challenge demands*								
	Workload	17	4990	.08	.10	−.01	.21	.89	.03
	Cognitive demands	3	479	.13	.18*	.09	.26	.00	.00
	Problem solving demands	2	374	.29	.36*	.23	.49	.48	.00
	Task complexity	1	396	.21	.25*				
Hind. demand crafting	*Hindrance demands*								
	Role ambiguity	6	2148	.11	.16	−.09	.41	.95	.06
	Role conflict	2	586	−.05	−.05	−.36	.25	.93	.04
	Interdependence	4	1242	.04	.06	−.09	.21	.79	.01
	Interpersonal conflict	1	103	.30	.37*				
	Emotional demands	7	945	.10	.14*	.01	.27	.72	.02
	Client incivility	1	428	.09	.12*				

Note: CI, I^2, and τ^2 cells are left empty for correlations with $K=1$. K values may differ between Tables 3 and 4, as Table 4 considers each bivariate correlation included across all studies, while Table 3 represents the pooled correlation values after same category correlations were estimated as described in the methodology.

Abbreviations: CI_L, lower bound of 95%-confidence interval for the reliability corrected pooled correlation coefficient; CI_U, upper bound of 95%-confidence interval for the reliability corrected pooled correlation coefficient; I^2, amount of variance due to heterogeneity; K, number of studies; N, total pooled sample size; ρ, pooled correlation coefficient; ρ_c, pooled correlation coefficient corrected for unreliability.

*$p < .05$.

with workload ($K=17$, $\varrho_c=.10$, [−.01; .21]) and for hindrance demand crafting most correlations were with emotional demands ($K=7$, $\varrho_c=.14$, [.01; .27]).

SEM results

The results of our SEM analyses for Models 1 and 3 are shown in Tables 5 and 6. We first look at the results for the 'Single IV-Single Mediator-Multiple Outcome' Models 1a–d (see Table 5). Hypothesis 1 concerned the indirect relationship between task resource crafting and employee outcomes via task resources. We found significant indirect relationships with regard to well-being (ab = .10 [.06; .14]) and positive attitudes (ab = .12 [.08; .17]), both in the expected direction. Importantly, the direct relationships between task resource crafting and the outcomes remain significant, indicating partial mediation. Thus, Hypothesis 1 found support in two of four cases.

Hypothesis 2 concerned the indirect relationships between social resource crafting and employee outcomes via social resources. Significant indirect relationships occurred for well-being (ab = .10 [.05; .15]) and positive attitudes (ab = .17 [.11; .24]). The direct relationship between social resource crafting and well-being and positive attitudes remained significant indicating partial mediation. Hypothesis 2 was supported in two of four cases.

Hypothesis 3, concerning the indirect effects of cognitive crafting, was not tested due to a lack of data.

Hypothesis 4 concerned the indirect relationships between challenge demand crafting and employee outcomes via challenge demands. A significant positive indirect relationship with job strain occurred via challenge demands (ab = .05 [.02; .09]). However, there was a significant direct negative relationship between challenge demand crafting and job strain ($\beta=-.20$, $p<.01$). No indirect relationships occurred for the other dependent variables. Hypothesis 4 was not supported.

Hypothesis 5, concerning the indirect relationships between hindrance demand crafting and employee outcomes via hindrance demands, was not supported (Model 1d, Table 4 and Figure 3). Contrary to expectation, we found a positive indirect relationship with regard to job strain (ab = .02 [.01; .05]) and there were no significant indirect relationships with regard to well-being (ab = .00 [−.01; .01]) or task performance (ab = .00 [−.02; .01]).

In Step 2 we tested the 'single IV-*multiple* mediator-multiple outcome' Models 2a–c to see whether any full mediation effects can be observed if task resources, social resources and challenge demands are considered simultaneously. This was, however, not the case.

Finally, in Step 3, we were interested in the redundancy and robustness of relationships. We tested a 'multiple IV-multiple mediator-multiple outcome' model (Model 3). In this model, the effect of a crafting strategy is estimated controlling for other crafting strategies. The results for task resource crafting (see Table 6 and Figure 2) partially support Hypothesis 1 with significant indirect relationships with regard to well-being (ab = .07 [.03; .12]) and positive attitudes (ab = .07 [.02; .12]), but not job strain (ab = −.06 [−.15; .02]) or task performance (ab = .01 [−.05; .06]). As in the single analyses, there was partial mediation for well-being but there is now also a full mediation for positive attitudes. The results for social resource crafting partially support Hypothesis 2. There was a significant indirect relationship with regard to well-being (ab = .05 [.01; .11]) and positive attitudes (ab = .13 [.07; .20]) but not job strain (ab = −.01 [−.10; .08]) or task performance (ab = .01 [−.03; .05]). The non-significant direct relationships with well-being and positive attitudes indicate full mediation here, compared to the single mediator analysis, where all mediations for social resources crafting were partial. Hypothesis 4 was not supported by Model 3, as challenge demand crafting had no significant indirect relationship with employee outcomes via challenge demands. One reason for this was the non-significant relationship between challenge demand crafting and challenge demands ($\beta=.04$, $p>.05$). Moreover, none of the direct relationships between challenge demand crafting and outcomes were significant. The results from Model 3 also have two notable indirect relationships that were not hypothesised. First, task resource crafting had a positive relationship with social resources ($\beta=.16$, $p<.01$) and an indirect relationship with well-being and positive attitudes via social resources (ab = .02 [.002; .05] and

TABLE 5 Summary of key effects for 'Single IV-Single Mediator-Multiple Outcome' Models 1a–d.

Job crafting strategy	Job characteristics	Outcome	Model	IV/DV	IV/M	M/DV	ab	CI$_L$	CI$_U$
Approach crafting									
Task resource crafting	Task resources	Well-being	1a	.39 (.04)**	.43 (.03)**	.23 (.04)**	.10*	.06	.14
		Job strain		−.09 (.07)		−.15 (.08)	−.07	−.14	.004
		Performance		.36 (.06)**		.03 (.06)	.01	−.04	.06
		Attitudes		.18 (.06)**		.29 (.05)**	.12*	.08	.17
Social res. crafting	Social resources	Well-Being	1b	.21 (.04)**	.40 (.04)**	.25 (.06)**	.10*	.05	.15
		Job Strain		−.08 (.06)		−.08 (.10)	−.03	−.11	.05
		Performance		.16 (.05)**		.07 (.04)	.03	−.01	.06
		Attitudes		.13 (.06)*		.43 (.07)**	.17*	.11	.24
Chall. demand crafting	Challenge demands	Well-Being	1c	.38 (.04)**	.15 (.04)**	−.01 (.06)	.00	−.02	.01
		Job Strain		−.20 (.04)**		.36 (.04)**	.05*	.02	.09
		Performance		.28 (.04)**		.02 (.03)	.00	−.01	.01
		Attitudes		.26 (.03)**		−.10 (.07)	−.01	−.04	.004
Avoidance crafting									
Hind. demand crafting	Hindrance demands	Well-being	1d	−.08 (.03)*	.11 (.03)**	−.04 (.04)	.00	−.01	.01
		Job strain		.12 (.07)		.22 (.07)**	.02*	.01	.05
		Performance		0 (.05)		−.02 (.05)	.00	−.02	.01
		Attitudes		-		-	-	-	-

Note: This table only show the results of the key hypothesised relationships. All other results are available on request. *$p < .05$, **$p < .01$.

Abbreviations: ab, indirect effect; CI$_L$, lower bound of Monte Carlo Simulated 95%-confidence interval for the indirect effect; CI$_U$, upper bound of Monte Carlo simulated 95%-confidence interval for the indirect effect.

TABLE 6 Summary of key effects for 'Multiple IV-Multiple Mediator-Multiple Outcome' Model 3.

Job crafting strategy	Job characteristics	Outcome	IV/DV	IV/M	M/DV	ab	CI_L	CI_U
Approach crafting								
Task resource crafting	Task resources	Well-being	.30 (.08)**	.40 (.07)**	.18 (.05)**	.07*	.03	.12
		Job strain	−.06 (.11)		−.15 (.10)	−.06	−.15	.02
		Performance	.31 (.09)**		.03 (.07)	.01	−.05	.06
		Attitudes	.10 (.10)		.17 (.06)**	.07*	.02	.12
Social res. crafting	Social resources	Well-being	.03 (.05)	.36 (.06)**	.15 (.06)*	.05*	.01	.11
		Job strain	−.05 (.08)		−.03 (.12)	−.01	−.10	.08
		Performance	−.02 (.07)		.02 (.05)	.01	−.03	.05
		Attitudes	.09 (.09)		.36 (.08)**	.13*	.07	.20
Chall. demand crafting	Challenge demands	Well-being	.09 (.08)	.04 (.09)	−.05 (.06)	.00	−.02	.01
		Job strain	−.09 (.09)		.37 (.04)**	.02	−.05	.08
		Performance	.08 (.10)		.00 (.03)	.00	.00	.01
		Attitudes	.02 (.08)		−.14 (.07)*	.00	−.04	.02

Note: This table only show the results of the key hypothesised relationships. Other results can be seen in Figure 2 and full results are available on request. *p < .05, **p < .01.

Abbreviations: ab, indirect effect, CI_L, lower bound of Monte Carlo simulated 95%-confidence interval for the indirect effect, CI_U, upper bound of Monte Carlo simulated 95%-confidence interval for the indirect effect.
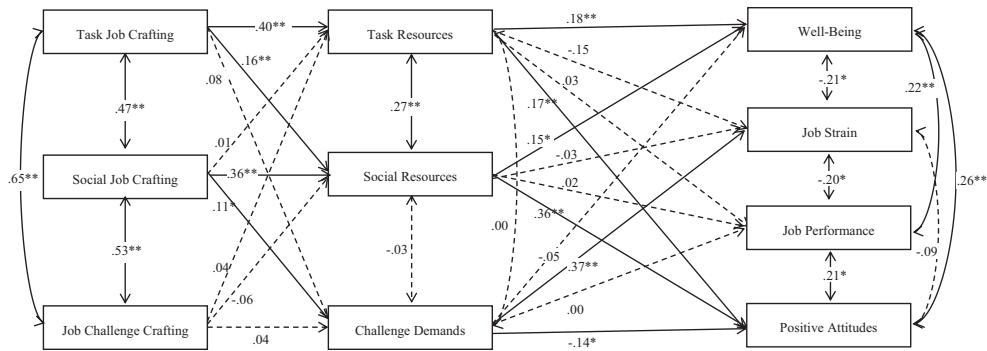
FIGURE 2   Results for model 3: Approach job crafting. *Note*: $* = p < .05$, $** p < .01$.
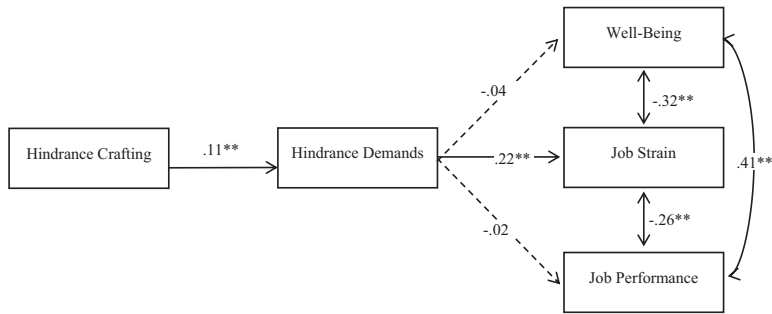

FIGURE 3   Results for model 1d avoidance job crafting, well-being and job strain. *Note*: $** \, p < .01$.

ab = .06 [.01, .11] respectively). Second, social resource crafting had a positive relationship with challenge demands ($\beta = .11$, $p < .05$) and a positive indirect relationship with job strain via challenge demands (ab = .04 [.002; .08]).

Our strategy for Model 3 was designed to account for and understand multicollinearity between variables. Indeed, a general observation is that increasing model complexity reduced the number of significant indirect relationships observed in the data. This was to be expected, since task and social crafting and also task and social resources are correlated and therefore the explained variance in the dependent variables is in parts redundant. In detail, the relationship between social resource crafting and task performance disappeared, as did that between challenge demand crafting and all job outcomes. This suggests that accounting for multicollinearity between job characteristics, and the relationships between job crafting strategies and non-congruent job characteristics, produces more conservative and more robust estimates of the direct and indirect relationships exhibited by job crafting.

Lastly, our examination of publication bias triangulation using different publication bias analysis methods suggests low risk of bias. We provide a fuller discussion of the publication bias results in the Appendix S1.

DISCUSSION

Our study makes two important contributions to the study of job crafting. First, we synthesise and integrate previous job crafting studies to provide greater theoretical and empirical clarity on a job crafting mechanism that is central to job crafting theory. Second, we provide a more complete and comprehensive understanding of the relationships between specific job crafting strategies, job characteristics and employee outcomes. This is in contrast to previous meta-analytic studies

of job crafting that do not include job characteristics (e.g., Boehnlein & Baum, 2020; Frederick & VanderWeele, 2020; Lichtenthaler & Fischbach, 2019; Oprea et al., 2019) or which are partial in their coverage of the relationship between job crafting and job characteristics, such as Rudolph et al. (2017) who examined the relationship between job crafting strategies and just two job characteristics (i.e., autonomy and workload) and Wang, Li, et al. (2020) who examined a global measure of job crafting in relation to two job characteristics (colleague support, supervisor support). Our findings also provide novel insights that go beyond those of job crafting reviews that do not address job characteristics, focus on job characteristics as antecedents or moderators of job crafting but do not address job characteristics as a mechanism through which job crafting shapes employee outcomes (e.g., Lazazzara et al., 2020; Tims et al., 2021; Wang et al., 2016; Zhang & Parker, 2019).

The results of our study provide support for a core mechanism of job crafting theory—the job characteristics mechanism—but only with regard to indirect relationships between job resource crafting and outcomes. Specifically, we find that task resources mediate the relationships between task resource crafting and well-being and positive attitudes. This suggests that, when employees use task resource crafting, they are able to change task resources in ways that produce a meaningful improvement in well-being and positive job attitudes. Similarly, we find that social job resources mediate the relationships between social resource crafting and well-being and job attitudes. This implies that, when employees use social job resource crafting, they are able to change social job resources in ways that produce a meaningful improvement in well-being and job attitudes. Overall, four of eight mediation effects are significant regarding task and social resource crafting, and three of these indicate full mediation. These results partially support of Hypotheses 1 and 2 and similar to the very limited number of studies that also test the job characteristics mechanism (Tims, Bakker, & Derks, 2013). One unexpected finding is the relationship between task resource crafting and well-being being mediated by social job resources. This suggests a positive 'spillover' relationship between task resource crafting and social resources. This may may occur, for example, when an employee's attempt to increase job discretion or task variety is noticed by others, who then provide social support and feedback to help the employee with this process (Tims & Parker, 2020). But a negative 'spillover' effect was found with regard to social resource crafting, which had a positive indirect effect on strain via challenge demands. Although it is important not to over interpret this one result, an explanation for this finding is that appreciation (Stocker et al., 2010) and encouragement (Feeney & Collins, 2015) are aspects of social support. Appreciation, positive feedback and encouraging behaviour from colleagues and superiors may lead to a targeted search for new challenges or to simply take on too much, which then leads to more strain.

We found no support for the job characteristics mechanism with regard to the indirect relationship between challenge demand crafting and employee outcomes via challenge demands. There is one significant indirect effect of challenge demand crafting (when examined without the presence of other job crafting strategies): It relates positively to challenge demands, which in turn relates positively to job strain. However, this describes a negative stressor effect. To qualify as a challenge demand, relationships with well-being and performance should also occur. But this is not the case, as the relationship between challenge demand crafting and challenge demands is not significant (in our complex model). This result is also in keeping with the longitudinal findings of Tims, Bakker, and Derks (2013). This suggests that challenge demands such as workload may be difficult to change as a result of individual job crafting alone.

Our hypotheses concerning hindrance demands is unsupported and, with regard to job strain, the relationship is in the opposite direction to that hypothesised. Specifically, we find a positive rather than negative indirect relationship between hindrance demand crafting and job strain via hindrance demands. This result corresponds to the findings of other meta-analyses that report a positive instead of the expected negative effect of reductive crafting (Boehnlein & Baum, 2020), prevention focussed crafting (Lichtenthaler & Fischbach, 2019) or hindering demands crafting (Rudolph et al., 2017) on strain. This may occur because, even though hindrance demand crafting may reduce hindrance demands in some circumstances, this form of crafting may make hindrance demands more salient, or require more effort than is saved through decreasing the demand. Another explanation compatible with the current

results is reverse causation. Those who have high hindrance demands may suffer from high job strain and therefore have more reasons and be more willing to use hindrance demand crafting to improve their job. This explanation is supported by Lichtenthaler and Fischbach (2019) who, in their meta-analytical analysis of longitudinal studies, found a positive effect of burnout on prevention-focused job crafting, which corresponds to hindrance demand crafting whereas the effect of prevention-focused crafting on burnout was only marginal.

In summary, the pattern of findings that emerges from our meta-analysis suggests that employees are able to craft job resources in ways that have a meaningful impact on their well-being and job attitudes. The indirect relationships between of task and social resource crafting and well-being and positive attitudes appear to be most robust in the various models we compute. Furthermore, our findings suggest that employees not only find it difficult to craft sustained improvements in job demands and that such attempts may have unintended negative consequences by increasing hindrance demands.

Theoretical implications

Our theoretical model proposes job characteristics as a core mechanism through which job crafting affects employee outcomes. However, support for this mechanism was partial (not all hypotheses are supported) and there were three significant direct relationships between job crafting variables and employee outcomes (e.g., task resource crafting with well-being and task performance, hindrance demand crafting with well-being) when job characteristics are included as mediators (Tables 5 and 6). This implies that job crafting might affect employee outcomes (such as task performance) independently of any change in job characteristics and there are at least four possible explanatory mechanisms for such effects.

The first is a job-person fit mechanism, which we highlighted earlier, in which improvements could result from crafting-induced changes in the person, such as learning and coping skills, that improve the fit with job demands. The second is a need-fulfilment mechanism. For example, job crafting may meet fundamental needs for autonomy, competence and relatedness, as it is a form of autonomous proactive behaviour that may promote mastery perceptions and involve collaborative working (Niessen et al., 2016; Oldham & Hackman, 2010) and as a result foster motivation and well-being. In support, Bakker and Oerlemans (2019) found that the positive indirect effects of daily task resource crafting and daily social resource crafting on daily engagement were mediated by, respectively, daily need for autonomy and daily need for relatedness. In a third mechanism, job crafting, as a form of proactive behaviour, could result in the person experiencing him/herself as self-efficacious (Bindl & Parker, 2010), which then has positive effects on employee outcomes, particularly if job crafting succeeds in changing working conditions over the short or long term. Lastly, in a fourth mechanism, the effort required when job crafting may deplete energy reserves and result in lower task performance and feelings of exhaustion (Baumeister & Vohs, 2004). Avoidance-motivated crafting, for example, may be particularly effortful because avoidance behaviour typically involves the constant monitoring of negative possibilities that provoke stressful reactions requiring additional regulatory effort (Elliot, 2006). This was supported by Bakker and Oerlemans (2019) who reported negative indirect effects of hindrance demand crafting on momentary engagement via momentary energy depletion, although they also found negative indirect effects for social resource crafting, and positive indirect effects for task resource crafting. A future challenge for job crafting research is therefore to test the relative effects of job crafting mechanisms and the contexts in which these mechanisms are strongest.

Our theoretical model also proposed that employees would be able to craft job demands in positive ways (e.g., increase challenge demands, decrease hindrance demands) and to craft their job in ways that improves task performance and job attitudes. This was not supported by our findings (and is in line with other meta-analyses unable to find positive effects of hindrance demands crafting, e.g., Boehnlein & Baum, 2020; Lichtenthaler & Fischbach, 2019; Rudolph et al., 2017) and suggests that stressors can be more difficult to change than resources (Sonnentag & Frese, 2013). For hindrance demand crafting, the

attempt to alter hindrance demands may make them far more salient and thereby increase the employee's perception that hindrance demands occur more frequently. This view is consistent with work on job design that suggests that the salience of job characteristics can be shaped by personal knowledge and action, the presence of other job characteristics, as well as social information about job characteristics (Bakker & Demerouti, 2007; Johns, 2010; Salancik & Pfeffer, 1978). Indeed, there is growing evidence that hindrance demand crafting may have 'negative' effects, not only in relation to outcomes such as well-being (Bakker & Oerlemans, 2019; Lichtenthaler & Fischbach, 2019; Rudolph et al., 2017) but also with regard to other job characteristics. For example, the meta-analysis by Rudolph et al. (2017) found a negative relationship between hindrance demand crafting and autonomy, while Harju et al. found a negative relationship between hindrance demand crafting and job complexity. For challenge demands there is the problem that workload is typically used as indicator of challenge demands (Cavanaugh et al., 2000). Others treat it as a hindrance demand (e.g., Rudolph et al., 2017). It must therefore be assumed that the experience of workload as a challenge or hindrance demand depends on boundary conditions (Kern, Trumpold, et al., 2021). This is important insofar as challenge demand crafting would lead to an increase in workload and hindrance demand crafting to a reduction of workload. Workload is likely not a goal per se. Rather people accept workload because it is related to more interesting tasks or responsibility. This, however, is already closely related to task resources, so that the effects of challenge demands disappear completely when analysed together with the other crafting strategies (see Model 3).

Some studies do provide evidence for crafting-induced improvements in job demands (Rudolph et al., 2017), as do the specific correlations between challenge demand crafting and cognitive demands found in this study. This indicates that, although employees may often find it difficult to craft job demands, they can in certain circumstances. Of course, there may be a number of reasons why an employee might struggle to craft his or her job (Parker et al., 2017). For instance, job crafting in jobs with high task interdependencies will require collaboration with coworkers and leaders, and depend on the interpersonal skills and support of those involved. However, relatively little theoretical attention has been given to the interpersonal context of job crafting. An exception is the work of Tims and Parker (2020) whose model proposes that the effectiveness of job crafting depends on whether coworkers attribute prosocial motives to the job crafter. When they do, it is argued that coworkers will respond favourably to the job crafter, e.g., by making adjustments to their own tasks.

A further theoretical implication of our findings is that they do not provide support for one job crafting theory over another (and it was not possible to compare them due to a lack of empirical data). Indeed, as we only found evidence of significant effects in relation to task crafting and social job crafting, the results could be read as supportive of role-based, resource-based or approach-avoidance based models, and it could be argued that role-based models should be preferred as they provide the most parsimonious account of these effects. But the lack of clear support for the approach-avoidance model of job crafting adopted in this study could simply reflect a lack of sufficient empirical evidence, as many of the types of crafting strategy proposed in approach-avoidance models have not been tested. Thus, given that approach-avoidance models of job crafting are more comprehensive, we would argue they still form a sound basis for future theoretical and empirical research.

Lastly, our theoretical model hypothesised job crafting as an antecedent of job characteristics. But based on cross-sectional data, we cannot make any firm conclusions about the hypothesised direction of effects, and recognise that the causal direction of the hypothesised effects of job crafting on job characteristics is open to question. For example, one alternative explanation for the positive relationship between task crafting and task resources, is that high task resources provide greater opportunity and support for task resource crafting (Rudolph et al., 2017; Wang, Li, et al., 2020). Although such an argument is plausible, job crafting theories assume that task resource crafting is primarily motivated by an absence of job resources, so employees with high task resources would have little motivation to engage in task crafting. Moreover, a number of studies suggest that increasing resources when they are already high can increase task uncertainty and the level of demand on the employee and thereby reduce rather than increase task performance and well-being (Sørensen & Holman, 2014; Xie & Johns, 1995). Rudolph et al. (2017) considered job crafting as a special form of proactive behaviour and argued that

autonomy, as an antecedent condition of proactivity and personal initiative (Tornau & Frese, 2013), may be a predictor of job crafting. As shown in Table S3 in the appendix, our data are compatible with the hypothesis that high resources lead to job crafting, which leads to better well-being. But this implies the assumption that those who already have good working conditions are particularly motivated to improve them even further, while those with poor working conditions tend not to try. In our view, this contradicts both needs-based and work design-based perspectives on job crafting.

As such, there are good theoretical reasons to believe that the positive relationships between job crafting and job resources do not result from job resources being antecedents of job crafting but, as hypothesised, result from job crafting acting primarily as an antecedent of job resources. These theoretical arguments, combined with supportive longitudinal evidence (Tims, Bakker, & Derks, 2013), therefore favour the proposed causal direction of job crafting on job characteristics. Nevertheless, we fully recognise that stronger longitudinal evidence is needed to be more confident of this and there is a particular need for studies that test the following causal order: poor job characteristics – job crafting – improved job characteristics – improved employee outcomes.

Limitations

Despite a number of strengths (e.g., the use of meta-SEM to analyse the mediation models and account for multicollinearity), this study has a number of potential limitations, many of which reflect those of the studies in our sample. First, our study is based on cross-sectional data and a lack of longitudinal data precludes testing causal direction. Second, the strength of the relationships between job crafting and job characteristics may be inflated by common method bias (Podsakoff et al., 2012), as almost all associations are based on self-report measures assessed using cross-sectional designs. The strength of relationships may also be inflated due to low discriminant validity between job crafting and job characteristics measures. Zhang and Parker (2019) note that items in some job crafting scales are similar to those used in job characteristics scales. For example, the item "I decide on how to do things" in the task crafting scale of Tims et al. (2012) reflects job discretion rather than the crafting of job discretion. These limitations could be addressed by using longitudinal designs and the development of measures that clearly differentiate between job crafting and job characteristics.

Third, the range of constructs covered in this meta-analysis is restricted. Due to a lack of data, we could not examine cognitive crafting or cover the full range of crafting strategies included in Zhang and Parker's (2019) approach-avoidance typology, such as avoidance-based crafting strategies that seek to reduce job resources. This means that we could not test broader and more comprehensive models of job crafting or compare different job crafting models. We therefore urge researchers in the future to test models of crafting based on Zhang and Parker (2019) approach-avoidance typology. In addition, for some categories of job characteristics, the range of job characteristics is relatively restricted and dominated by one particular type. For example, task resources were typically assessed with a measure of job discretion and social resources were typically assessed with a measure of social support. Future studies could include a wider range of job resources and job demands to enable a better understanding of the fidelity of job crafting strategies.

Fourth, a common criticism of meta-analysis is that categorisations of variables can mask divergent relationships. We sought to overcome this by basing variable categorisations on theories that specify consistent types of effect for each variable category, and we split affective outcomes into well-being and job strain, as they can be differentially related to job demands. However, we acknowledge that the classification of certain job demands as either a challenge or a hindrance demand can be open to question. For example, we classified workload as a challenge demand using the challenge-hindrance demand framework (Crawford et al., 2010). According to this framework, employees appraise demands as challenge demands when they are stimulating and linked to valued outcomes such as performance. But recent work has questioned whether this is always the case (Kern, Trumpold, et al., 2021) and suggests that demands may only be appraised as challenges when they represent a central and legitimate aspect of

one's job (Semmer et al., 2019), relate to core work goals (Prem et al., 2017; Van den Broeck et al., 2010) and can be coped with (Pearsall et al., 2009). Thus, while many employees may appraise workload as a challenge and seek to increase it, other employees may appraise workload as a hindrance and seek to decrease it. This may explain the non-significant relationship between challenge demand crafting and challenge demands. Future research on job crafting could therefore seek to understand how appraisals of job demands affect whether employees try to craft increases or reductions in them.

A further possible limitation is the risk of publication bias. However, our publication bias analysis that triangulated different methods suggested that the overall risk for publication bias was low (Schmidt & Hunter, 2015; Siegel et al., 2022). The main reason for this may be that the correlations were drawn from any study including the key variables (i.e., job crafting, job design, and outcomes) regardless of whether these variables were central to the original study. For example, task autonomy was often used as a control variable. Therefore, the insignificance of a single correlation would not have hindered a publication strongly compared to a study that focuses on a specific correlation, only. Further, we did include unpublished studies which further reduces the risk of publication bias. Moreover, the main purpose of our study was to conduct meta-analytical summaries of structural relations among job crafting scales, job characteristics, and dependent variables, while controlling for measurement error. For that we used the meta-SEM approach (Cheung, 2015a, 2015b) which aggregates correlations matrices and fits a structural equation model to the aggregated reliability corrected correlation matrix. Therefore, in using a meta-SEM approach we are answering calls by Steel et al. (2021) who suggest integrating information beyond average effect sizes.

CONCLUSION

The main aim of this study was to examine whether effects of job crafting on employee outcomes occur via job characteristics. The support we find with regard to task and social resource crafting suggests that the job characteristics mechanism is a plausible and empirically founded explanation for the effects of job crafting, although alternative explanations especially related to a general lack of strong causal evidence could not be ruled out. However, we find no support for the mediating role of job demands and our results suggest that employees may struggle to craft aspects of their job, especially job demands. Given this, we make the following recommendations with regard to research on job crafting. First, it is imperative that studies include job characteristics as a mediator to further test a key job crafting mechanism until a time when this mechanism has been firmly established or unless there is good reason not to. Second, studies need to test multiple mechanisms and compare the relative effects of job characteristic and other mechanisms. Third, to better understand why employees may struggle to craft their job, researchers need to develop and test models that consider the interpersonal context of job crafting. Fourth, to reflect the broad range of crafting strategies proposed in approach-avoidance model of job crafting, a wider set of job crafting measures need to be developed, and these measures should not confound job crafting with job characteristics. Lastly, longitudinal and quasi-experimental studies, preferably with multiple time points, are needed to establish the causal direction of job crafting, job characteristics and employee outcomes.

AUTHOR CONTRIBUTIONS
David Holman: Conceptualization; data curation; formal analysis; writing – original draft; writing– review and editing. **Maximiliano Escaffi-Schwarz:** Conceptualization; data curation; formal analysis; writing – original draft; writing – review and editing. **Cristian A. Vasquez:** Conceptualization; data curation; formal analysis; writing – original draft; writing – review and editing. **Julien P. Irmer:** Conceptualization; data curation; formal analysis; writing – original draft; writing – review and editing. **Dieter Zapf:** Conceptualization; data curation; formal analysis; writing – original draft; writing – review and editing.

CONFLICT OF INTEREST STATEMENT
None declared.

DATA AVAILABILITY STATEMENT

The data and code that support the findings of this study are available https://osf.io/bzdn4/.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Appendix S1

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