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“Just Noticeable” Differences in Pay: A Systematic Review of Past Accomplishments and Future Opportunities

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Abstract

Compensation is of critical importance to organizations. However, seemingly arbitrary increases in employee compensation may result in operational inefficiencies. The systematic review focuses on just noticeable differences (JNDs) in pay, a rarely examined topic in the compensation literature, despite its potential to turn compensation policies and practices into strategic resources (or negative synergies). We provide a state-of-the-science review of empirical research on JNDs in pay, highlighting key concepts and empirical evidence to date. To advance the JNDs in pay literature, we integrate expectancy and equity theory with the basic tenets of the JND phenomenon. In the process, we develop an individual-level motivational framework focused on the JND threshold and the important role it plays for several relevant employee outcomes. We develop propositions to

Evaluations

SERVICE	SUMMARY	VERSION	DATE	EVALUATED
ResearchHub	3.5/5	1	12/11/25	
ReviewerZero AI	No issues found	1	12/11/25	
paper·wizard.		1	12/11/25	

Registration

Not available. This was an inductive systematic review with no confirmatory analyses.

Materials

Full data are provided in the manuscript along with a PRISMA diagram and a description of the search strategy.

Data

Full data are available in the manuscript.

Code

Not applicable for the systematic review.

Paper

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Compensation is of critical importance to organizational stakeholders (Gerhart & Rynes, 2003). The U.S. Bureau of Labor Statistics (2022) estimated that $9.7 trillion was spent on payroll expenses in 2021. These costs often comprise the most expensive budget items for firms (Fulmer & Li, 2022). Compensation is also one of the strongest predictors of applicant attraction to organizations (Chapman, Uggerslev, Carroll, Piasentin, & Jones, 2005), and is associated with higher levels of productivity (Heneman & Werner, 2005). For these and related reasons, according to the resource-based view (RBV) of the firm (Barney, 1991), a compensation system can be a source of competitive advantage (Banks & Kepes, 2015). However, if organizations arbitrarily increase compensation without considering important contingencies, it may result in operational inefficiencies (Heneman, 1992) and potentially lower levels of organization performance (e.g., Gerhart & Rynes, 2003; Kepes, Delery, & Gupta., 2009). Despite a considerable amount of research on compensation, there are still important limitations in our knowledge of how to turn compensation policies and practices into strategic resources.

One concept particularly relevant for reducing operational inefficiencies and potentially creating a strategic resource for organizations is the concept of “just noticeable differences” (JNDs) in pay (Mitra, Gupta, & Jenkins, 1997). JNDs in pay research suggests that pay raises awarded to employees must reach a certain threshold to become meaningful and consequently have a motivational effect on employees’ attitudes and behaviors. Understanding those factors that influence an employee’s JND threshold and how it affects important employee outcomes can shape the compensation policies and practices of an organization. In turn, such policies can become a strategic resource. Despite the potentially crucial role that the JND threshold may play for individual and organizational outcomes, our understanding of when and how JNDs in pay operate is limited. This is problematic for three primary reasons.

First, research suggests that the strategic human resource management (SHRM) literature often conflates official policies and practices with employee evaluations of those practices (Banks & Kepes, 2015; Lengnick-Hall, Lengnick-Hall, Andrade, & Drake, 2009). This is highly problematic, as studies reveal that employees tend to perceive HRM activities differently than their employers (i.e., the officially stated policies or practices; e.g., Liao, Toya, Lepak, & Hong, 2009; Takeuchi, Lepak, Wang, & Takeuchi, 2007). Hence, employers may report giving employees a pay raise; yet, unless a specific threshold is crossed, the psychological effects (employees’ evaluations) may not be strong

enough to motivate desired attitudinal and behavioral changes (Mitra, Tenhiälä, & Shaw, 2016). Beyond this threshold, pay raises may not result in significantly stronger, desirable changes in employee attitudes and, more importantly, employee behaviors. Thus, it is important to establish what the optimal threshold is.

A second major limitation in the literature pertains to the omission or scarce examination of several theoretically and practically important factors influencing JNDs in pay. Factors such as individual differences (e.g., gender, preference for immediate gratification vs. a larger future reward), individual future expectations (e.g., salary increase expectations, projected inflation rate), individual social comparisons, organizational and job characteristics (e.g., compensation and other HRM activities), and external environment characteristics (e.g., actual unemployment rate) make it unlikely that there is one universal JND threshold. The lack of attention to these contingency factors hampers our understanding of the conditions under which JNDs in pay may result in employee attitudinal and behavioral changes that are desirable to an organization.

Third, the literature on JNDs in pay lacks a strong theoretical framework and is currently tested under mixed frameworks or in a manner that seems devoid of strong theoretical grounding. Without a comprehensive framework that explicitly accounts for these issues, the overall effectiveness of compensation systems aimed at helping organizations achieve a competitive advantage is highly questionable. Moreover, the lack of a theoretical foundation can hinder theoretical development on the topic and, as a result, can also impede evidence-based management. This is particularly problematic considering the applied nature of compensation.

To address these limitations, we review empirical compensation research focused on JNDs in pay. Our review begins with a brief discussion of how the concept of JNDs in pay can be used to inform an organization's compensation activities to create a strategic resource for organizations. We then review key concepts in the broad JNDs literature, as well as the current empirical work on JNDs in pay. By reviewing this latter empirical literature, we acknowledge past accomplishments and identify opportunities for future research. To further advance this literature, we next build on the opportunities for future research identified to develop an integrative individual-level motivational framework, grounded in expectancy and equity theory. This framework focuses on the antecedents of the JND threshold and the important role the threshold plays for several relevant employee attitudes (e.g., job satisfaction) and behaviors (e.g., task performance). Given the importance of compensation to all organizational stakeholders, the key role JNDs in pay can play in reducing operational inefficiencies, and the considerable limitations of prior JNDs in pay literature, this work is timely and practically significant.

JNDs IN PAY AND RELATED CONCEPTS

The concept of JND has its roots in psychophysics and Weber's Law (Guilford, 1954, Gescheider, 1976; Mitra et al., 2016). Weber's law explains that changes in the intensity or magnitude of a stimulus that can "just" be detected are a fixed proportion of the initial stimulus level (Champlin &

Kopelman, 1991; Mitra et al, 2016, 1997). Traditionally, Weber's law has been applied to physical stimuli such as brightness of a light, loudness of a noise, or the intensity of an electric shock (Worley, Bowen, & Lawler, 1992; Mitra et al., 1997). For instance, Weber's Law suggests that the just noticeable change in the brightness of a light is a proportion of how bright the light was to begin with (Stevens, 1975). This implies that there is a stable relative threshold, not an absolute one, at which humans detect a change in the brightness of a light.

Weber's Law has been extended to the concept of pay (e.g., Hinrichs, 1969; Zedeck & Smith, 1968). This phenomenon has been referred to in the literature as the smallest meaningful pay increase, just meaningful difference, and the just noticeable difference (Mitra et al., 2016). In this vein, a JND in pay is a function of an employees' current salary (Rambo & Pinto, 1989). That is, employees perceive a pay increase as meaningful when it reaches or exceeds a particular threshold, which will evoke positive reactions, such as affective responses, behavioral intentions, and actual behaviors (Mitra et al., 1997; Rambo & Pinto, 1989). Because the notion of JNDs in pay is much more subjective than the evolutionary roots of Weber's Law (Rambo & Pinto, 1989), we explain the core theoretical tenets below as they relate to pay.

Stimulus

At the heart of Weber's Law and JNDs is a stimulus. In the context of compensation, pay is the stimulus (Zedeck & Smith, 1968,). It follows, then, that changes in stimuli represent changes in pay, and the intensity of such changes refers to the magnitude or how large the pay increase is (Mitra et al., 1997). In turn, this influences the assessed value of the reward. Employees can consider the magnitude of the pay increase in two ways (Hinrichs et al., 1980). First, they might interpret the pay increase in terms of absolute dollar amounts. That is, if the employee's salary is $50,000 per year, the absolute amount of a pay increase may be $2,500. Alternatively, employees may interpret the magnitude of the pay increase in relative terms as a percentage of current earnings. Drawing again on the example of the employee making $50,000 per year, the employee may consider the increase as 5% of their current earnings.

Threshold

Traditionally, the threshold in Weber's Law refers to "the amount of objective change that is required before a perceptual change is detected" (Worley et al., 1992, p. 560). Applied to pay, it is the point of the "just noticeable difference" in two stimuli: the current pay and the pay after the raise. Specifically, the threshold is the point at which an employee perceives a pay raise to be large enough to be meaningfully different from their current pay (Heneman, 1992; Mitra et al., 2016). This marks a divergence from traditional research on Weber's Law in that perceptions of changes in pay are not physical or sensory distinctions; rather, determining what is meaningful is subjective and can be based on a number of personal factors beyond current earnings (e.g., average size pay

increases, changes in the cost of living or personal expenses, and satisfaction with one's job) (Krefting & Mahoney, 1977).

In tests of Weber's Law, the threshold is determined by asking participants to distinguish between the intensities of the two stimuli (Mitra, et al., 1997). The level at which the two stimuli are noticeably different from one another is considered to be the threshold. When estimating a JND with respect to pay, the threshold is the level at which individuals report a change in the cognitive labels or orientation they have assigned to the change in pay (Mitra et al., 1997, 2016; Rambo & Pinto, 1989). Alternatively, researchers might ask participants for the smallest pay increase amount that they would consider to be meaningful (Krefting & Mahoney, 1977). Research suggests that a JND in pay is around 5% to 7% of current earnings (Mitra et al., 1997; 2016). However, as noted before, there are a number of under- and unexplored factors that may affect whether or not an employee perceives a pay raise to actually be one. We describe these factors in the following sections.

USING JNDs IN PAY KNOWLEDGE TO CREATE A STRATEGIC RESOURCE

Compensation is important for attracting, motivating, and retaining employees (Gerhart & Fang, 2014; Gerhart & Rynes, 2003). However, as compensation tends to be the biggest expense for organizations (Gerhart & Rynes, 2003), it is important to manage compensation systems and their policies, processes, and practices (also collectively referred to as HRM or compensation "activities;" Kepes & Delery, 2007) well, to maximize the economic value added. To achieve a competitive advantage over rival firms using compensation activities, careful consideration must be given to how these activities are implemented and used (Banks & Kepes, 2015). For a compensation practice to serve as a strategic resource, it is important that employees perceive and respond to the practice as intended by the organization. For instance, for a merit-based pay system to work, employees need to evaluate the system as actually being merit-based; it matters little how the HR director or other managers view the merit pay system.

JNDs in pay capture the cognitive processes associated with how employees perceive compensation activities, particularly those related to pay raises. That is, an employees' JND threshold is the point at which they perceive a pay raise to be meaningful and to *really* change attitudes and behaviors (Mitra et al., 1997). As a result, understanding JNDs in pay is one possible means to turn compensation-related activities into strategic resources. If firms do not provide a sufficient pay raise to bring about these changes, the intended effect for the pay increase will not occur. This creates an operational inefficiency, as the pay raise awarded was essentially wasted; the organization expended the money, yet there is no marked change in employee attitudes and behaviors. Moreover, if firms pay well above the critical threshold to create the desired change in employees, the intended effects do occur, but another economic inefficiency may be created if the magnitude of the intended effects does not match the magnitude of the pay increase. Thus, in the current work, we seek to first review the accumulated knowledge on JNDs in pay. We then build on

that knowledge to develop a framework that captures the motivational role of the JND threshold, grounded in expectancy and equity theories, and theorize about important contingency effects for future research to consider. As a result, we pave the way for incorporating JND threshold knowledge into compensation policies and practices, to help organizations create compensation-related strategic resources, and ultimately a sustained competitive advantage.

PAST ACCOMPLISHMENTS: A REVIEW OF EMPIRICAL STUDIES ON JNDs IN PAY

To understand trends in JNDs in pay research, we conducted a systematic review of the current JNDs in pay and related compensation research. In January of 2020, we searched multiple databases in PsychNet, EBSCOHost, and ProQuest that spanned the psychology, management, and economics literatures, to identify JNDs in pay related research (a targeted supplemental search in December of 2022 did not change our final sample size). We searched the databases using combinations of the following keywords: *pay raise, pay increase, wage increase, salary increase, perceived equitable payment (PEP), noticeable or meaningful threshold, Weber's Law, Model or Ratio, Lawler or Fechner Model, psychophysical law, constant proportion principle.* After removing duplicates, this search yielded 1,940 articles. We then reviewed abstracts to determine if they were relevant to JNDs in pay and retained 17 empirical articles. We next coded each article for the identified JND threshold and the type of scale used (e.g., the perceived magnitude of the pay increase, affective reactions related to the pay increase). Our final sample consisted of 15 articles with 63 unique samples. The entire search and winnowing process is depicted in Figure 1.

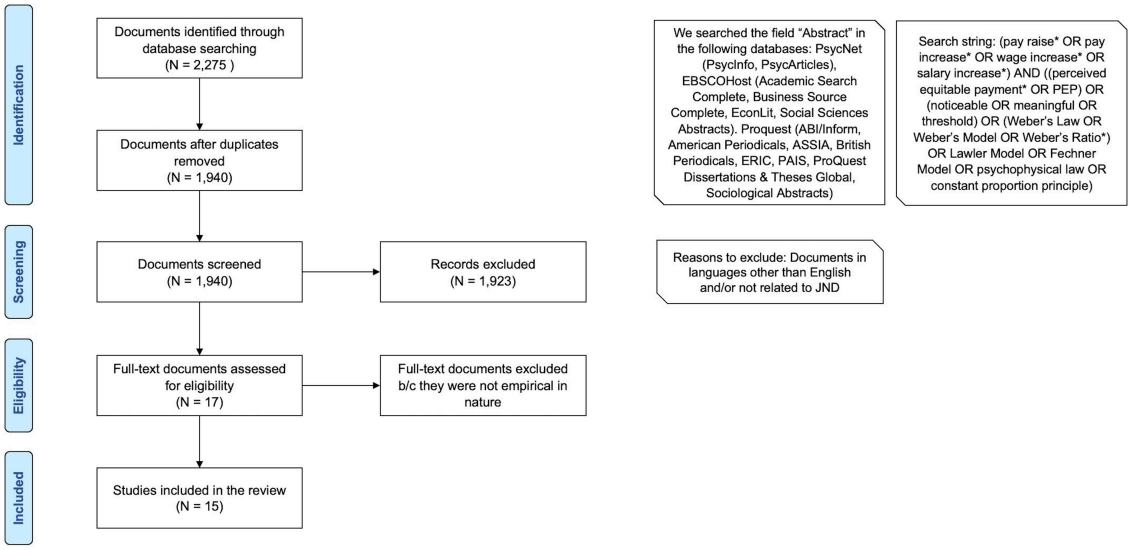

Figure 1. Search and Winnowing Process. Description: The depiction of the search and winnowing process for our systematic review of the literature on JNDs in pay and compensation captures aspects such as the databases

searched, search strings, inclusion/exclusion criteria, and sample information at different stages of the review process.
Note. JND = just noticeable differences.

As previously highlighted, most prior empirical research on pay raise thresholds is based on classical psychophysics and Weber's Law (Gescheider, 1976). Whereas some findings support the constant proportion principle of Weber's Law (i.e., a given percentage salary increase has the same perceived attractiveness for all employees), other evidence does not. Instead, this research emphasizes how other factors significantly influence JNDs in pay thresholds. In the sections below, we review the existing empirical research and organize it based on: 1) thresholds for JNDs in pay (highlighting whether support for JNDs based on current pay has been found), 2) antecedents and covariates, and 3) outcomes associated with JNDs in pay. More detailed information on JND thresholds and the types of scales used to assess their outcomes is presented in Table 1. Specifically, the table identifies each study and includes their sample sizes (n), the different thresholds (or threshold ranges; JND1 through JND4) used, and the type of scale that was used to determine the JND threshold (or threshold range [type of scale]). Next, we discuss the findings regarding the JND thresholds in more detail.

Table 1. Empirical Evidence on the JNDs in Pay Threshold

Author	Year	n	JND threshold				Type of scale
			JND1	JND2	JND3	JND4	
Mitra et al.	1997	192	2.3 to 3.2%	6.9 to 7.9%	11.7 to 11.9%	13.9 to 14.5%	Magnitude
Mitra et al.	1997	192	1.2 to 2.8%	6.4 to 7.5%	11.60%	nr	Affect
Mitra et al.	1997	192	3.50%	6.2% to 7.0%	9.3% to 9.4%	10.2 to 11.3%	Behavioral intent
Mitra et al.	1997	94–96	nr	7.5%–20.80%	nr	nr	Magnitude, affect and behavioral intent
Rambo & Pinto	1989	109	2.2–4.4%	4.0–9.9%	9.3–19.3%	21.2–39.3%	Magnitude
Rambo & Pinto	1989	109	1.9–4.9%	4.4–9.3%	8.5–16.2%	18.5–33.4%	Affect
Champlin & Kopelman	1991	2,039	3.9 to 6.7%	6.7 to 12.1%	11.2 to 24.4%	16.3 to 50.9%	Magnitude and affect

Kopelman	1991	547	4.9 to 5.5%	8.0 to 10.6%	12.1 to 22.9%	18.7 to 51.4%	Magnitude and affect
Futrell & Schul	1980	466	4.8–6.7%	8.8–9.9%	15.4–17.8%	26.3–31%	Magnitude and affect
Futrell & Varadarajan	1985	349	5.9%	8.5%	13.4%	20.8%	Magnitude and affect
Futrell & Varadarajan	1985	349	nr	7.5%	nr	nr	Magnitude
Futrell & Varadarajan	1985	349	nr	10.50%	nr	nr	Fairness
Hinrich	1969	18	5.1%	9.1%	22.0%	45.0%	Magnitude and affect
Hinrich	1969	96	4.2%	7.8%	15.0%	34.0%	Magnitude and affect
Hinrich	1969	107	3.7%	6.9%	14.0%	32.0%	Magnitude and affect
Hinrich	1969	95	3.3%	6.0%	12.0%	26.0%	Magnitude and affect
Hinrich	1969	113	3.3%	6.3%	13.0%	28.0%	Magnitude and affect
Hinrich	1969	122	3.2%	6.0%	12.0%	23.0%	Magnitude and affect
Hinrich	1969	193	3.1%	5.9%	12.0%	22.0%	Magnitude and affect
Hinrich	1968	160	3.0%	5.7%	11.0%	21.0%	Magnitude and affect
Hinrich	1969	173	2.9%	5.4%	10.0%	18.0%	Magnitude and affect
Hinrich	1969	34	2.2%	4.3%	8.0%	15.0%	Magnitude and affect
Hinrich	1969	30	3.9%	8.0%	17.0%	45.0%	Magnitude and affect
Hinrich	1969	113	3.5%	6.4%	13.0%	30.0%	Magnitude and affect
Hinrich	1969	81	3.5%	6.4%	12.0%	26.0%	Magnitude and affect
Hinrich	1969	70	3.4%	6.2%	12.0%	26.0%	Magnitude

							and affect
Hinrich	1969	35	3.5%	6.5%	13.0%	24.0%	Magnitude and affect
Hinrich	1969	14	3.1%	5.6%	11.0%	19.0%	Magnitude and affect
Hinrich	1969	12	3.5%	6.0%	10.0%	26.0%	Magnitude and affect
Hinrich	1969	9	3.7%	6.5%	12.0%	21.0%	Magnitude and affect
Heneman & Ellis	1982	76	nr	10.9%	nr	nr	Meaningfulness
Krefting & Mahoney	1977	203	nr	$699 (mean) +/- $496(std)/yr	nr	nr	Magnitude
Worley et al.	1992	639	nr	5%	nr	nr	Attractiveness
Zedeck & Smith	1968	66	nr	5.0–8%	nr	nr	Meaningfulness
Pinto	1979	109	8%	16.30%	29.40%	73.50%	Magnitude
Pinto	1979	109	4.40%	9.90%	19.30%	39.30%	Magnitude
Pinto	1979	109	4.20%	8.40%	16.10%	37.20%	Magnitude
Pinto	1979	109	2.20%	5.50%	11.10%	33.30%	Magnitude
Pinto	1979	109	1.80%	4%	9.30%	21.20%	Magnitude
Pinto	1979	109	2.10%	4.40%	10.10%	22.10%	Magnitude
Pinto	1979	109	8.60%	13.10%	20.90%	42.60%	Affect
Pinto	1979	109	4.90%	9.30%	16.20%	33.40%	Affect
Pinto	1979	109	3.30%	6.60%	11.40%	28%	Affect
Pinto	1979	109	5.10%	10.60%	12.30%	22%	Affect
Pinto	1979	109	1.60%	3.20%	7%	14.70%	Affect
Pinto	1979	109	1.90%	4.40%	8.50%	18.50%	Affect
Pinto	1979	109	34.2%	nr	nr	nr	Behavioral intent
Pinto	1979	109	19.1%	nr	nr	nr	Behavioral intent
Pinto	1979	109	14.6%	nr	nr	nr	Behavioral intent
Pinto	1979	109	17.8%	nr	nr	nr	Behavioral

							intent
Pinto	1979	109	10.5%	nr	nr	nr	Behavioral intent
Pinto	1979	109	7.5%	nr	nr	nr	Behavioral intent
Pinto	1979	109	37.2%	nr	nr	nr	Behavioral intent
Pinto	1979	109	17.6%	nr	nr	nr	Behavioral intent
Pinto	1979	109	15.5%	nr	nr	nr	Behavioral intent
Pinto	1979	109	14.8%	nr	nr	nr	Behavioral intent
Pinto	1979	109	11.9%	nr	nr	nr	Behavioral intent
Pinto	1979	109	8.1%	nr	nr	nr	Behavioral intent
Pinto	1979	84	4.50%	10.30%	17.90%	32.60%	Magnitude
Pinto	1979	84	1.70%	4.40%	9.80%	21.70%	Magnitude
Pinto	1979	84	2%	5.50%	11.60%	26.30%	Magnitude
Pinto	1979	84	2.20%	6.80%	12.40%	21%	Magnitude
Pinto	1979	84	3.80%	8.80%	16.30%	38.80%	Affect
Pinto	1979	84	1.70%	3.50%	7.90%	18.70%	Affect
Pinto	1979	84	2.50%	5.50%	11.10%	28.30%	Affect
Pinto	1979	84	2.70%	5.10%	10%	19.10%	Affect
Pinto	1979	84	13.4%	nr	nr	nr	Behavioral intent
Pinto	1979	84	8.2%	nr	nr	nr	Behavioral intent
Pinto	1979	84	9.9%	nr	nr	nr	Behavioral intent
Pinto	1979	84	10.3%	nr	nr	nr	Behavioral intent
Pinto	1979	84	16.1%	nr	nr	nr	Behavioral intent
Pinto	1979	84	9.2%	nr	nr	nr	Behavioral intent

Pinto	1979	84	6.8%	nr	nr	nr	Behavioral intent
Mitra et al.	2016	177	3.8%	4.7%	5.4%	5.6%	Magnitude
Mitra et al.	2016	177	3.7%	4.3%	5.6%	nr	Affect
Mitra et al.	2016	177	4.2%	5.0%	nr	nr	Behavioral intent
Mitra et al.	2016	495	5.0%	4.2%	5.7%	8.4%	Behavioral intent
Mitra et al.	2016	495	5.5%	7.2%	7.2%	9.6%	Affect

Note: n = Sample size; nr = not reported.

JNDs in Pay Thresholds

Although empirical work on JNDs in pay is limited, a few studies found support for the idea that JND thresholds are most strongly influenced by current pay. That is, a particular increase in pay, as a percentage of current pay, may be perceived as a meaningful increase across different individuals and jobs (Zedeck & Smith, 1968; Worley et al., 1992; Mitra et al., 1997, 2016). Other research suggests that evaluations of income increments are not a simple function of current pay (i.e., pay level) and identified various predictors and boundary conditions for the threshold (e.g., Heneman & Ellis, 1982; Champlin & Kopelman, 1991; Mitra et al., 2016).

Using a sample of junior executives and female secretaries employed by an academic institution, Zedeck and Smith (1968) tested several pay increases, ranging from 5 to 11.5%, and concluded that a 5 to 8% pay increase is likely meaningful across jobs. However, they noted that, in their sample, JNDs were higher for junior executives than for secretaries. Similarly, Worley et al. (1992) used pay increases ranging from 2% to 20% and examined how each increase affected employees with different pay levels. They found that a given percentage increase had essentially the same perceived attractiveness regardless of current pay level. Although attractiveness increased throughout with a higher pay raise, it did so at a decreasing rate, a finding aligned with theorizing around JNDs. Moreover, using a sample of 192 student “employees,” two pay levels and six pay raise levels ranging from 1.2% to 20.8%, Mitra et al. (1997) reported that increases in pay below 7% are unlikely to result in positive employee reactions or changes in attitudes and behaviors. Mitra et al. (2016) further explored thresholds in JNDs in two distinct field studies: a two-wave study of 177 employees of a university medical center in the U.S. and a study of 495 university employees in Finland using increases in the range of 3.7% to 9.6%. The authors found stable reactions to JND thresholds at about 5% of current pay in the U.S. sample and at about 8% in the Finish sample.

Whereas the studies above identified specific percentages of pay increases that are perceived as meaningful and provided recommendations based on them, other studies cautioned that several variables other than current pay can significantly affect the JND threshold. For example, Hinrichs

(1969) used pay increases in the 2.2% to 45% range to examine whether an individual's current level of earnings is strongly related to their perception of a given amount of incremental pay. They also explored whether average perceptions of small, average, or large increases formed a relatively constant function of current pay level. The author concluded that current pay explains much of the variance in perceptions of pay increases but argued that demographic variables also significantly influence the magnitude of the JND threshold. Other studies suggesting that demographic factors, as well as other factors such as personal and job characteristics, economic factors, and future expectations affect the JND threshold are briefly reviewed below.

In two different studies, Pinto (1987) found that JNDs were not a constant percentage of current pay and instead revealed a decreasing function. The author used a very wide range of pay increases (1.7 to 73.5% of current pay) and concluded that other variables, such as family income (presented in more detail the next section) can account for a significant percentage of the variance in JNDs. Similar findings to those of Pinto (1987) and Worley et al. (1992) were reported by Rambo and Pinto (1989). Using pay increases in the range of 1.9% to 39.3% of current pay, the authors reported that, contrary to Weber's Law, the JND threshold was a decreasing percentage of current pay, and, although current pay accounted for a significant part of the explained variance in the JND threshold, other variables, such as expectations regarding future promotions or perceived equity of current salary, had a considerable impact on judgements related to meaningful pay increases. Moreover, using pay increases in the range of 4.8% to 31%, Futrell and Schul (1980) also showed that JND thresholds differ between high- and low-paid executives, and, just as suggested by Hinrich (1969), demographic factors also strongly affected the JND threshold. Furthermore, Futrell and Varadarajan (1985) used pay increases ranging from 5.9% to 20.8% of current salary and reported that perceived personal and job characteristics and non-monetary outcomes influence the JND threshold. Heneman and Ellis (1982) examined how personal characteristics, economic factors, and future expectations variables affect JNDs. The authors concluded that more micro-economic (rather than macro-economic) variables may be the primary source of influence on JND thresholds. Last, in a study using the largest sample used to date in examining JNDs and pay raises in the range of 3.9% to 50.9% of current pay, Champlin and Kopelman (1991) found that the JND threshold is not constant across individuals, and that individual differences and economic variables affect it. They also concluded that evaluations of income increments are not a simple function of current pay and that different predictors and patterns of JND thresholds are possible across organizations.

Finally, some authors examined meaningfulness of a pay increase as a type of JND threshold measure (e.g., Heneman & Ellis, 1982; Zedeck & Smith, 1968). Factors such as current pay, average work week (hours), and expected size of next pay raise were found to significantly impact the perceived "meaningfulness" of the next raise. Fairness of the pay raise was also assessed as an outcome. For instance, Futrell and Varadarajan (1985) included a scale to measure perceptions regarding the fairness of pay raises. In their study, aside from individual characteristics such as skill and training, effort and job level and responsibility, current pay and pay history significantly affected perceptions of fairness associated with the pay increase.

Overall, most prior empirical work on JNDs in pay suggests that current pay explains significant variance in the magnitude of the JND threshold (for an exception, see Krefting & Mahoney, 1977), either on its own, or in conjunction with other factors. We review and organize these additional factors into categories in the next section.

Antecedents and Covariates of JNDs in Pay Thresholds

Demographic Factors. Hinrichs (1969) found higher pay raise expectations (and thus a higher JND threshold) for college educated employees vs. non-college educated ones, for younger vs. older employees, exempt vs. nonexempt employees, and, among the nonexempt employees, for men vs. women. Similarly, Futrell and Schul (1980) found that older employees have significantly lower expectations and JND thresholds for an average pay raise than younger ones, but that those with marginal supervisory experience required a significantly large raise for the increase to be perceived as average than more experienced ones, and college educated employees reported lower expectations regarding an increase than those who were not college graduates.

Champlin and Kopelman (1991) found sex effects on the evaluation of pay and JND thresholds, whereby women are less satisfied with their current pay and perceive a higher increase as meaningful, as compared to 1) men and 2) other women in prior studies. Futrell and Varadarajan (1985) also reported that JND thresholds are affected by age and experience, skills and training, effort, and performance. Heneman and Ellis (1982) examined the role of various demographic factors (e.g., age, tenure, education level, number of dependents) in affecting the JND threshold as well, although they did not find them to significantly impact the latter. Both Zedech and Smith (1968) and Futrell and Schul (1980) suggested that JND thresholds are affected by current pay levels, with highly-paid employees having higher pay raise expectations. Thus, higher JND thresholds would be needed to generate a reaction when compared to low-paid employees.

Economic Factors. Krefting and Mahoney (1977) found that 1) consumption, 2) associated income increments to keep up with the cost of living, 3) prior pay increases, and 4) expected pay increase all contribute significantly to the formation of JND thresholds, with consumption being the best single predictor. Pinto (1987) also reported that expected starting salary and family income account for a significant percentage of the threshold variance. Similarly, Heneman and Ellis (1982) examined the effects of current pay and economic variables, such as size of the prior raise, gross family income, own gross income, tax bracket, and average weekly work hours. They found that one's expected size of the next raise and average weekly work hours were significantly related to the JND threshold. Last, Champlin and Kopelman (1991) determined that inflation affects an individual's evaluation of income and wealth increments. Based on this, they concluded that JND thresholds have increased over time for groups with constant dollar incomes, but also for those with constant purchasing power.

Future Expectations. Several of the studies reviewed above show that it is not only actual pay increases that influence the JND threshold, but also expectations about future pay raises (e.g., Futrell & Schul, 1980; Heneman & Ellis, 1982). Research has shown that variables related to future expectations impact the JND threshold. For instance, Hinrichs (1969) suggested that probable earnings potential influences the JND threshold. Pinto (1987) found that expectations regarding the economic outlook, such as prospects for promotion, projected inflation rate, and regional economic prospects, explain significant variance in JNDs. Heneman and Ellis (1982) also examined various factors related to future expectations (e.g., expected change in the cost of living, estimated months until next raise, difficulty in obtaining a new job). They found that expectations with regards to the size of the next raise and difficulty in obtaining a new job significantly affect the JND threshold. In terms of the latter expectation, the JND threshold was significantly higher for employees who viewed themselves as highly marketable.

Other Antecedents and Covariates. Several studies found that perceptions of current salary equity explain a significant portion of the variance in JNDs (e.g., Futrell & Varadarajan, 1985; Pinto, 1987; Rambo & Pinto, 1989). The importance individuals place on money also emerged as a significant predictor of JNDs in Pinto's (1987) study. Additionally, Futrell and Varadarajan (1985) suggested that job characteristics such as job level and responsibility, job difficulty, and perceived non-monetary outcomes (e.g., status and security), also influence the JND threshold.

Outcomes of JND Thresholds

Aside from striving to identify threshold levels and antecedents of JNDs in pay, studies have also explored outcomes associated with them. For instance, Worley et al. (1992) examined the attractiveness of the pay increase (i.e., the degree to which subjects would be interested in finding out about a bonus program which offered a certain per cent increase in pay) as an outcome. They reported that it was unrelated to current pay level after controlling for the size of the percentage increase and, instead, found a curvilinear relation between the attractiveness of the pay raise and its size—although attractiveness increased throughout, it did so at a decreasing rate—supporting the idea that JNDs may have diminishing returns.

Mitra et al. (1997; 2016) assessed other important outcomes associated with the JND threshold, such as magnitude (i.e., participants' perception of how large the change in pay is; e.g., no change, modest, substantial), affective reactions (e.g., feeling pleased, indifferent, disappointed with the pay raise), and behavioral intentions (e.g., whether participants intended to work at the same level or a lot harder than before the pay raise). They conceptualized meaningfulness as the cognitive dimension capturing behavioral intent and indicating that the pay raise was motivationally effective. They also acknowledged actual behaviors (i.e., spending and saving) as outcomes, but did not use them in their studies. As noted previously, Mitra et al. (1997) found that a pay raise of about 7% leads to substantial changes in employees' perceived magnitude of the pay increase,

affect, and behavioral intentions. In a later study with samples from the U.S. and Finland, Mitra et al. (2016) reported that a pay raise of about 5% causes changes in the three types of outcomes among American employees, but the required pay increase was larger (at least 7.2%) in the Finish sample. Furthermore, behavioral intentions required an even larger pay raise (8.4%).

Magnitude and affective outcomes were also used in the earlier studies of Pinto (1987), together with behavioral intent outcomes in the form of planned savings (i.e., subjects were asked to indicate when a salary increment would change their savings behavior) and planned spending (i.e., subjects were asked to indicate when a salary increment would change their spending habits). Factors such as present salary and equity in pay (i.e., the organization offering fair pay and raises) influenced all three types of outcomes. In terms of the latter, individuals who felt unfairly paid had higher JND thresholds necessary to get stronger attitudinal and behavioral reactions. In general, prior empirical work has suggested that, within current salary level intervals, JNDs for magnitude and affective outcomes are similar, but differ from those of behavioral intent or behavioral outcomes.

FUTURE OPPORTUNITIES IN JNDs IN PAY RESEARCH

In the previous section, we summarized the cumulative knowledge on JNDs in pay, with a focus on the empirical evidence. We now turn our attention to future research opportunities and, in doing so, we develop a conceptual framework grounded in two prominent individual-level motivation theories, expectancy theory (Lawler, 1971; Vroom, 1964) and equity theory (Adams 1963; 1965). The purpose of this framework is to examine and explain the JND threshold's effects on employee job attitudes and behaviors (see Figure 2).

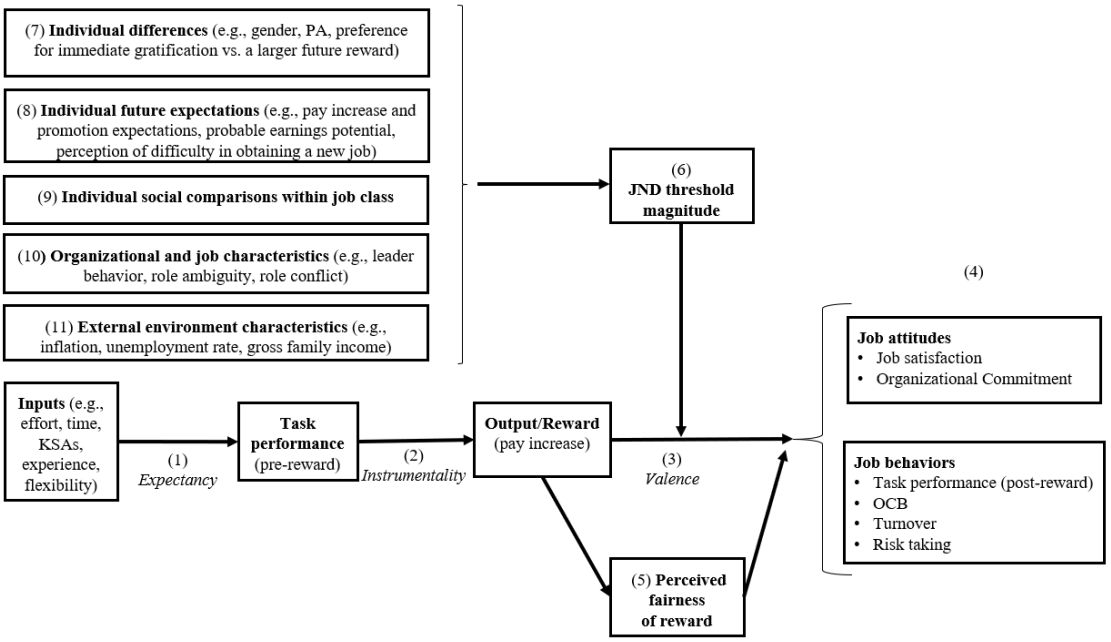

Figure 2. An Integrative Framework of JND Threshold Effects on Job Attitudes and Behaviors. Description: The depiction of the integrative framework proposed captures how the strength of relations between pay increase and attitudinal and behavioral outcomes are influenced by the magnitude of the JND threshold and what factors may affect the JND threshold.
Notes. JND = just noticeable differences; PA = positive affect; KSAs = knowledge, skills, and abilities, OCB = organizational citizenship behavior

We now develop propositions on important unexplored or underdeveloped areas, to encourage future research on JNDs in pay.

Integrating Expectancy and Equity Theories to Advance JNDs in Pay Research

***Expectancy theory* suggests that employees will put forth effort to perform at a high level to obtain organizational rewards (Vroom, 1964). It predicts that employees will be motivated to perform depending on: 1) the intensity of their expectation that their effort will achieve a certain level of performance (i.e., expectancy; Figure 2, Box 1), 2) the perception that a given level of performance will be rewarded (i.e., instrumentality; Figure 2, Box 2), and 3) the value of the reward to the employee (i.e., valence; Figure 2, Box 3). Specifically, the model proposed by expectancy theory has employee effort as the predictor, performance as the mediator and an organizational reward (e.g., pay raise, bonus, promotion) as the outcome. Despite the theory's significant acclaim and support since publication, it has also received considerable criticism over the decades for not taking into account the many individual-level factors other than effort likely affecting performance (e.g., Horst, 1982; Mitchell, 1974).**

***Equity theory* (Adams 1963; 1965) addresses this issue by acknowledging a number of "inputs" an employee brings to a job and the larger organization. These inputs include effort as well as time, knowledge, skills, and abilities (KSAs), experience/training, or employee characteristics such as adaptability or flexibility. It proposes that individuals are motivated to achieve a high level of performance when they perceive their outcomes (i.e., organizational rewards) are commensurate with their inputs. We thus argue that the incomplete picture put forth by expectancy theory in terms of the expectancy linkage (i.e., the effort to performance relation) can be addressed by replacing effort with the broader category of inputs proposed by equity theory. Specifically, we propose that individual inputs affect performance, which, in turn, affects individual outputs/rewards, including pay raises.**

Because our framework aims to advance JNDs in pay literature, we focus specifically on pay increases as an individual output (i.e., reward), either as an absolute dollar amount or a percentage of the current salary. In line with equity theory, we argue that, once the reward has been obtained, employees evaluate the reward against their inputs. Thus, we

propose a new linkage, from the individual output/reward (i.e., the pay raise) to the employee's perceived fairness of the output (Figure 2, Box 5), as it is the perceived fairness that, according to equity theory, has a motivational effect likely to trigger changes in employee attitudes and behaviors. With these new linkages established, there is one aspect of expectancy theory not fully theorized in prior representations/models of the theory and our integrative model: valence. Specifically, prior research does not elaborate on what factors other than the reward itself may affect valence, and what valence results in, in terms of organizationally-relevant employee attitudes and behaviors. We argue that valence is a crucial aspect of expectancy theory, as it is valence that motivates employees to perform and, just as equity theory's perceived fairness of the reward, can trigger attitudinal and behavioral workplace outcomes. Therefore, it is here where our research aims to bring a substantial contribution to expectancy, equity, and the JNDs in pay literatures. We argue that a JND in pay threshold must be achieved for the pay raise to have enough valence to affect an employee's motivation, and thus lead to organizationally desired effects. In other words, if a pay increase is minimal (e.g., a 2% cost of living increase), it is unlikely to be valued enough to cause attitudinal or behavioral changes. For example, a 2% increase may not be perceived as a raise at all if it does not equal or surpass the rate of inflation. Despite its importance, the JNDs in pay threshold is a neglected concept in the discussion of expectancy theory and pay (see Banks, Woznyj, Kepes, Batchelor, & McDaniel, 2018) for an exception on tipping as a form of a compensation practice). To address this limitation in prior research on individual-level motivation, we integrate the JNDs in pay threshold into our framework (Figure 2, Box 6), acknowledging its role as an important moderator in the relation between the individual output (i.e., the pay raise) and job attitudes and behaviors (Figure 2, Box 4). Below we elaborate on our model's constructs and the proposed relations. Based on our prior systematic review of the literature, we also offer and integrate within our framework a number of factors, at different levels of analyses, likely to affect the JND threshold (Figure 2, Boxes 7–11).

Attitudinal and Behavioral Outcomes

Job satisfaction and *organizational commitment* have been two of the most extensively researched job attitudes to date, given their importance to employees' identities, well-being, and their effects on workplace behaviors (Judge, Weiss, Kammeyer-Mueller, & Hulin, 2017; Serban, Rubenstein, Bosco, Reina, & Grubb, 2022). As such, our framework captures these two constructs as attitudinal outcomes. Job satisfaction has been defined as "the positive emotional state resulting from the appraisal of one's job or job experiences" (Locke, 1976, p. 1300) and organizational commitment as an employee's emotional bond with the organization, based on personal identification with the

organization's goals and values, a willingness to employ effort for the organization, and a desire to stay in the organization (Meyer & Allen, 1997).

In terms of behavioral outcomes, we focus on three of the most widely studied workplace behaviors: *task performance, extra role behavior,* and *turnover* (Becton, Carr, Mossholder, & Walker, 2017; Van Scotter, 2000). Whereas task performance, also referred to as in-role performance, refers to work behaviors prescribed by formal job roles (e.g., adequately completing assigned duties, meeting formal performance requirements of the job) (Williams & Anderson, 1991), extra-role behavior refers to "individual behavior that is discretionary, not directly or explicitly recognized by the formal reward system, and in the aggregate promotes the effective functioning of the organization" (Organ, 1988, p. 4). Examples include staying late to finish a project, helping the supervisor or other co-workers with heavy workloads when not asked to do so, or speaking positively about the company (Williams & Anderson, 1991). Finally, voluntary turnover refers to an employee's decision to terminate the employment relationship (Dess & Shaw, 2001).

Evidence indicates that compensation affects employee attitudes and behaviors (Gupta & Shaw, 2014). In terms of job attitudes, studies suggest that pay raises improve job satisfaction and organizational commitment. In particular, pay increases make employees feel valued, recognized, and fairly treated by the organization, increasing their job satisfaction (Tekleab, Bartol, & Liu, 2005). Yang, Miao, Zhu, Sun, Liu and Wu (2008) reported substantial increases in job satisfaction after a pay raise. Vandenberghe and Tremblay (2008) found a positive relation between pay satisfaction (a likely outcome of a pay increase) and organizational commitment. They suggested that this may be attributed to the norm of reciprocity theorized under social exchange theory: when an organization provides resources to the employee in the form of a pay raise, it creates a sense of indebtedness on the part of the employee. One way the employees may discharge the felt obligation is by becoming more committed to the organization (Kehoe & Wright, 2013).

As for workplace behaviors, research indicates that financial incentives, such as a pay raise, positively affect task performance (Jenkins, Mitra, Gupta, & Shaw, 1998; Garbers & Konradt, 2014). This may be because pay acts as a reinforcer for certain behaviors (i.e., when employees receive a pay increase, they see it as a signal that they should continue engaging in the behavior(s) that preceded the reward) and/or because, as social exchange theory (Blau, 1964) suggests, they may reciprocate increased pay from the organization by exerting more effort on behalf of the organization (thereby enhancing task performance). Similar positive effects of financial incentives on extra-role behavior have been found and alike rationales have been proposed (e.g., Morita, 2020). Finally, with regard to voluntary turnover, evidence suggests that compensation is key to retaining employees (Rahman & Chowdhuri, 2018). In their meta-analysis on the antecedents and correlates of turnover, Griffeth, Hom, and Gaertner (2000) found a weak, negative relation (r = -.06) between pay and turnover. They suggested that pay increases reduce turnover because they help to maximize employees' self-interest and signal an organizational investment in employees, thus

inducing organizational commitment. Indeed, studies have found a negative relation between organizational commitment and turnover (e.g., Van Dierendonck & Jacobs, 2012).

In addition to these three traditionally studied behaviors, we add an under-studied behavior: *risk-taking.* Although not typically assessed by JNDs in pay research as an outcome, we suggest that risk-taking behavior is a relevant outcome. This type of behavior represents a double-edged sword, as, on the one hand, organizations want to encourage employees to display such behavior in order to innovate and remain competitive in the marketplace (Shapira, 1995; Zhou & Shalley, 2011). On the other hand, excessive risk-taking can severely hurt an organization, as illustrated by the collapse of Lehman Brothers at the beginning of the recent financial crisis (Williams, 2010). As with the other outcomes in our framework, one of the factors that affect risk-taking behavior are financial incentives. Although largely ignored in the management compensation literature (e.g., Gerhart & Rynes, 2003; Gupta & Shaw, 2014), studies in the areas of finance and accounting have shown that financial incentives affect risk-taking behavior; the higher the magnitude of the incentive, the more likely it is that individuals display excessive risk-taking behavior (e.g., Brink, Hobson, & Stevens, 2017).

As research has established several determinants of financial rewards and linked them to the aforementioned job attitudes and behaviors, we do not offer propositions for these main effects, although we account for them in our framework (see Figure 2, Boxes 1–4). We also do not offer propositions for the effects of perceived fairness of the reward (Figure 2, Box 5) on the outcomes of focus, as these relations have been established as well (e.g., Ramaswami, & Singh, 2003; Witt & Nye, 1992). Rather, our contribution is in theorizing how the strength of relations between the reward (i.e., pay increase) and attitudinal and behavioral changes are influenced by JNDs in pay, specifically, by the JND threshold magnitude (i.e., the level at which a pay increase is perceived as significant or meaningful; Figure 2, Box 6) and what factors neglected by prior literature may affect the JND threshold (Figure 2, Boxes 7–11). We elaborate on this in the next section.

Factors Affecting the Magnitude of the JND Threshold

We start with the assumption that all pay increases, whether they cross the JND threshold or not, are guaranteed. However, changes in attitudinal and behavioral outcomes may differ depending on various currently largely unexplored factors likely to affect the magnitude of the JND threshold, including individual differences, individual expectations about one's future, individual social comparisons within job class, organizational and job characteristics, and external environment characteristics.

Individual Differences. Several studies suggest that *sex* may affect the JND threshold with respect to relevant workplace outcomes. Previous research suggests that there are different JND thresholds between men and women (Abd-El-Fattah, 2010; Shaw, Duffy, Mitra, Lockhart, & Bowler, 2003). However, no sex differences in affect or behavioral intentions outcomes from pay raises were

observed. Although their findings are somewhat contradictory, these studies suggest that men and women may have different JND thresholds at which pay raises translate into attitudinal and behavioral changes. Given some of the mixed evidence, more investigations are needed.

Research also indicates that individuals of different *ages* are motivated by different types of incentives, with those in an early career stage being more motivated by financial rewards (Finegold, Mohrman, & Spreitzer, 2002; Khatri, Fern, & Budhwar, 2001). Because of increased accumulated savings, workers at later career stages tend to experience a decreased sensitivity to materialistic rewards, such as pay raises from their organizations and place more emphasis on social workplace rewards, such as job autonomy and positive relationships with coworkers (Kpecker, 1994). When performance-based raises are provided throughout an organization, Scott, Shaw, and Duffy (2008) reported that older employees may interpret the financial reward as a social one, as older employees reported higher levels of organization-based self-esteem after the reward, whereas younger employees did not. Scott et al. also found that the relation between a pay raise and organization-based self-esteem was stronger for older than for younger employees, as long as the pay raise was perceived as equitable (i.e., based on performance). Given that a pay raise may be interpreted either as a financial or a social reward (or both), it is unclear whether the JND threshold is higher for younger or for older employees.

Positive and negative affectivity refers to an employees' disposition to experience positive and negative affect (PA and NA), respectively, across situations (Watson, Clark, & Tellegen, 1988). Those high in PA tend to interpret situations positively, whereas those high in NA tend to see the worst in situations. Research suggests that high NA individuals are more reactive to negative stimuli (i.e., punishment) and less to positive stimuli (i.e., rewards). Moreover, those high in NA tend to exaggerate the fear associated with financial and psychological losses (Panaccio, Vandenberghe, & Ben Ayed, 2014). Thus, it is likely that those high in NA have a higher JND threshold and, therefore, need a larger pay raise to experience attitudinal and behavioral changes. Along those lines, Shaw et al. (2003) suggest that low PA individuals are, to a great extent, apathetic and fairly insensitive to rewards. Thus, a small pay raise would likely escape their detection. In other words, for low as compared to high PA individuals, a larger pay raise would be needed for positive attitudinal and behavioral workplace outcomes. As such, it is likely that, just as in the case of high NA individuals, low PA individuals also have a higher JND threshold.

An employee's *preference for immediate gratification versus a larger future reward* may also impact the JND threshold. Delayed reward discounting, a concept that spans multiple disciplinary areas ranging from psychology to economics, is particularly relevant in this respect, as it focuses on the specific role delays in rewarding individuals play in their decision making. It is defined as the speed at which a reward loses its value as a function of its temporal distance (MacKillop, Amlung, Few, Ray, Sweet, & Munafò, 2011). That is, the longer the delay, the larger the extent to which the reward may lose value. Thus, delayed reward discounting recognizes that there is typically a tradeoff in which a delay makes it necessary for the reward to be of larger value (i.e., higher

valance) to yield the same effect as a reward that is immediately available. Not making a logical decision in an economic sense is considered a poor reward valuation and a self-control failure (Kahneman & Tversky, 2000; MacKillop et al., 2011). Interestingly, the nature of delayed reward discounting does not appear to have a consistent rate across rewards contexts, and time periods (Fredrick, Loewenstein, & O'donoghue, 2002). This reflects a level of subjectivity and nonlinear effects in preferences (Ainslie, 2001), which has a direct effect on the JND threshold.

Specifically, a JND threshold may be quite large if the reward is distal. Evidence in the JNDs in pay literature suggests that, on average, a 5% to 7% pay increase is needed to reach a critical threshold to yield a change in attitudes and behaviors. However, this may also be a function of the proximity of the pay raise to the behavior that earns it. For instance, a raise just one week after a particular behavior was displayed or a particular goal reached may actually have a lower required threshold, perhaps of 4%. As a reward loses value over time (MacKillop et al., 2011), a pay increase a year or two from now may need to be considerably larger, perhaps 10% or more, in order for employees to perceive it as meaningful, depending on how strong their preference for immediate gratification versus a larger future reward is.

As indicated in our review section, other individual differences that can affect the JND threshold are factors such as one's education level, experience, training, current salary, prior raises, and consumption. Although we do not elaborate on all these factors in this section, taken together, the literature has shown that individual differences influence the JND threshold. While our framework's individual differences category should be viewed as including all these and other variables, we offer a proposition for what we see as conflicting or under-developed areas within individual differences: gender, age, PA, NA, and preference for immediate gratification vs. a larger future reward. Thus, we do not include a direction for effects, but forward a general proposition:

Proposition 1: Individual differences (gender, age, PA, NA, preference for immediate gratification vs. a larger future reward) influence the magnitude of the JND threshold.

Given the conflicting evidence on these individual differences' effects, we also ask:

Research Question 1: How does each individual difference (gender, age, PA, NA, preference for immediate gratification vs. a larger future reward) affect the magnitude of the JND threshold?

Individual Future Expectations. In addition to individual differences, an individual's expectations about their own future may influence the magnitude of an employee's JND threshold. Specifically, variables such as pay increase expectations (e.g., Futrell & Schul, 1980; Heneman & Ellis, 1982; Krefting & Mahoney, 1977) or probable earnings potential (Hinrichs, 1969), expected change in cost of living and difficulty in obtaining a new job (Heneman & Ellis, 1982), and prospects for promotion, projected inflation rate, and regional economic prospects (Pinto, 1987) have been found to influence the JND threshold. As these variables do not influence the threshold in the same way

(e.g., a higher expected inflation rate likely leads to a higher threshold, but difficulty in obtaining a new job to a lower one), we do not include a direction for effects, but offer a general proposition:

Proposition 2: An individual's expectations about the future affect the magnitude of the JND threshold.

Individual Social Comparisons within Job Class. Aside from individual differences and expectations about the future, individual social comparisons may also affect the JND threshold. Social comparison theory suggests that employees evaluate themselves and their pay relative to others, inside or outside of their organizations (Huseman, Hatfield, & Miles, 1985; 1987). Social comparisons are recognized within equity theory, and also play a role in other motivational theories aimed at understanding how employees contextualize their pay and their pay increases. For instance, social comparisons within one's job class, arguably the most relevant comparisons an employee can make in relation to pay, can be applied to expectancy theory to better understand valence assessments on the part of employees (Goodman & Haisley, 2007).

Thus, we propose that social comparisons within one's job class are highly relevant and can help understand the context in which employees are interpreting their relative increase. For example, an employee might evaluate their pay raise relative to a co-worker's, previous pay raise experiences, or the pay raise of someone external to the focal organization in a similar job. Such comparisons can influence the likelihood that a given pay raise magnitude results in attitudinal or behavioral changes. Specifically, social comparisons within the job class can influence the JND threshold, such that the threshold might be higher when social comparisons are unfavorable (e.g., when a focal employee perceives that a referent other has put in the same amount of effort and received a higher raise), as, in such cases, the employee's motivation is decreased. Thus, we formally put forth:

Proposition 3: Social comparisons within one's job class influence the magnitude of the JND threshold, such that the JND threshold is higher when the focal employee's pay increase relative to others is perceived as unfavorable.

Organizational and Job Characteristics. Research suggests that factors in the employees' work environment, such as *leadership behaviors,* influence job attitudes. For instance, Judge, Piccolo, Podsakoff, Shaw, and Rich (2010) indicated that job satisfaction is highest when leadership behaviors are productive and favorable (i.e., consideration or other transformational leader behaviors) and lowest when leadership behaviors are not favorable (i.e., unethical behaviors). As such, it is entirely possible that a higher pay raise is perceived as meaningful and triggers attitudinal and behavioral changes under unfavorable leadership behavior conditions. That is, the JND threshold may be lower under favorable leadership behaviors and higher under unfavorable ones.

Aspects of the work environment in the form of job characteristics influence the JND threshold as well. As mentioned previously, the literature has examined factors such as job responsibility, job

difficulty, and non-monetary outcomes associated with jobs, including status and security. We argue that *role stressors* (e.g., role ambiguity, role conflict) and *job design characteristics* (e.g., autonomy, skill variety, task significance) likely affect the JND threshold and are worth examining. Whereas one could get a pay raise that is noticeable, if different aspects of the work environment are perceived negatively, the pay raise may not translate into attitudinal or behavioral changes. For example, employees who experience heightened role stressors may have a higher JND threshold, as they would likely need a larger pay increase to feel that their stressors are worth the trouble. In other words, a larger JND threshold is likely when aspects of the work environment, such as organizational and job characteristics are unfavorable. As such, we propose:

Proposition 4: Organizational and job characteristics (e.g., leader behaviors, role stressors, job design characteristics) influence the magnitude of the JND threshold, such that the threshold is higher under unfavorable characteristics.

External Environment Characteristics. A last category of factors likely influencing the magnitude of the JND threshold are environmental characteristics external to the work environment. As indicated in our review section, the current literature on JNDs in pay suggests that factors such as inflation, expected change in cost of living, gross family income, and difficulty in obtaining a new job are important factors to consider (Champlin & Kopelman, 1991; Heneman & Ellis, 1982; Pinto, 1987). This research suggests that, when the environment external to the organization is viewed favorably and individuals see themselves as marketable (i.e., their perceived ease to get another job is high), their JND threshold is higher than when the environment external to their organization is viewed negatively (e.g., Heneman & Ellis, 1982). Our environmental characteristics category should be viewed as comprehensive and including all these factors. As we view each of these factors as important, and all are under-studied, we do not highlight any in particular for future research, but forward a general proposition:

Proposition 5: Environmental characteristics influence the magnitude of the JND threshold, such that the threshold is higher under favorable environmental characteristics.

The JND Threshold as a Boundary Condition for Attitudinal and Behavioral Outcomes

As mentioned earlier, research has shown that a pay raise triggers positive changes in employees only when it reaches or exceeds the JND threshold (e.g., Champlin & Kopelman, 1991; Mitra et al., 1997, 2006). Once the threshold has been established, we expect that receiving a raise above it will strengthen the relation between the awarded raise and attitudinal outcomes. Receiving a pay raise that exceeds the JND threshold will likely result in a positive affective reaction, as more of the employee's personal goals can be accomplished (Vroom, 1964; Porter & Lawler, 1968). A pay raise above the JND threshold also signals that employees are cared for and valued by the organization (Eisenberger, Armeli, Rexwinkel, Lynch, & Rhoades, 2001), which will fulfil the former's social and

esteem needs (Ilies, Lanaj, Pluut, & Goh, 2018; Maslow & Lewis, 1987). Prior research suggests that fulfillment of these needs translates into higher job satisfaction (e.g., Ilies et al., 2018; Riggle, Edmondson, & Hansen, 2009). Similar reasoning can be applied to explain an increase in the strength of the relation between a pay raise and organizational commitment when the JND threshold is exceeded. With a higher pay raise, employees will achieve more personal goals and feel they are treated well by their employer, thus enhancing their feelings of attachment and loyalty towards their organization.

Employees receiving a pay raise above their threshold are also likely motivated to maintain or improve their task performance so that they can obtain another raise, or simply in a desire to repay their organization for treating them well (as noted above). Just as with in-role performance, extra-role performance will likely increase when the organization exceeds employees' JND threshold for a pay raise. Reinforcement theory (Skinner, 2014) explains why employees would continue to display these types of behavior if extra-role behaviors are something their organization/managers take into account when evaluating performance and determining a raise. Social exchange theory (Blau, 1964) suggests a stronger relation between the magnitude of a pay raise and behavior when extra-role behaviors are not formally rewarded/considered in evaluations (i.e., employees engage in extra-role behaviors to reward the organization for treating them well). Given that we expect a stronger relation between a pay raise and both positive attitudinal and behavioral changes (i.e., task performance and extra-role behavior), we forward a general proposition for the effects of the JND threshold magnitude in this relation:

Proposition 6: The JND threshold magnitude moderates the relations between pay raise and 1) job satisfaction and organizational commitment attitudinal changes and 2) task performance and extra-role behavioral changes, respectively, such that the relations will be stronger when the pay increase exceeds the JND threshold magnitude.

As prior research suggests that turnover is generally negatively related to organizational commitment and to pay raises, we expect that a pay raise above the JND threshold will weaken the relation between the raise and turnover. Formally, we propose:

Proposition 7: The JND threshold magnitude moderates the relation between pay raise and turnover behavioral changes, such that the relation will be weaker when the pay increase exceeds the JND threshold magnitude.

As for risk-taking behavior, we expect that the size of the pay increase will be positively related to risk-seeking activities and risk-taking behaviors. According to prospect theory, individuals tend to display risk-seeking behavior in a loss domain and avoid risky behavior in gain domains (Kahneman & Tversky 1979; Tversky & Kahneman 1981). However, this general relation is reversed under extreme conditions when an individual perceives to have a very small probability of an enormous loss or gain. A large pay raise, one that is substantially larger than one's JND threshold, may qualify as such a gain condition, especially if there is no downside potential (Lopes, 1987). That

is, in the worst-case scenario, one's base pay remains unchanged. Under this condition, individuals may display excessive risk-taking behaviors in an attempt to obtain the "prize of high pay" (Bloom, 1999, p. 28). By contrast, a potential pay increase that is consistent with the JND threshold may motivate individuals to engage in levels of risk-taking behaviors that are more desirable to an organization. Finally, anticipated pay increases that fall well below the JND threshold do not motivate individuals to display any particular performance-related behaviors, including desired risk-taking ones. Taken together, we propose that increasing the magnitude of financial incentives can increase the likelihood for excessive risk-taking behaviors, especially if one's base pay is unaffected, and the incentive is well above the JND threshold. As such, we put forth:

Proposition 8: The JND threshold magnitude moderates the relation between pay raise and risk-taking behavioral changes, such that the relation will be stronger when the pay increase exceeds the JND threshold magnitude.

METHODOLOGICAL RECOMMENDATIONS

The ultimate goal of the conceptual review and the theoretical framework we proposed is to guide and encourage much-needed empirical research on JNDs in pay. To further facilitate this endeavor, we briefly touch upon some important methodological recommendations that can be used when conducting such research on the topic.

First, a number of research designs must be used to study the phenomenon of interest. We recommend a triangulation approach. This involves the use of multiple study designs, samples, and measures. For instance, experimental designs are the "gold standard" for drawing causal inferences (Antonakis, Bendahan, Jacquart, & Lalive, 2010). Such designs maximize internal validity and a number of studies in the JNDs in pay literature already use such designs. However, the external (rather than internal) validity of such designs can also be increased by using real compensation as well as actual performance work tasks (Colquitt, 2008). To further increase external validity, experimental designs may be completed with observational field studies. Additionally, quasi-experimental designs may also be used, as they are often more viable in field contexts (Podsakoff & Podsakoff, 2019). While the latter may only allow for limited causal inferences, they generally offer more external validity than laboratory studies. Finally, field studies have the highest external validity, but generally lower internal validity. To allow for causal inferences, these studies would need to employ longitudinal designs to properly test the relations in our framework, especially regarding phenomena such as delayed reward discounting and risk-taking.

Second, research should include more concrete measures in relation to the JND threshold. In the extant literature, three main scales have been used to assess the size of JNDs in pay: magnitude, affect, and behavioral intention scales. Magnitude scales assess the actual size of a pay raise that is

perceived as meaningful, affective scales measure the JND threshold at which positive affective reactions occur, and behavioral intentions scales assess the threshold at which individuals plan on changing their behaviors (e.g., working a little harder). Unfortunately, the assessed outcomes in the existing literature are predominantly affective in nature. Although this is understandable, other outcomes ought to be assessed as well, such as traditionally examined job attitudes (e.g., job satisfaction) and, more importantly, performance-related outcomes. To this date, no study has examined whether behaviors *actuallychange*whether employees really worked harder following a pay raise that exceeded the JND threshold. Measuring actual behaviors as opposed to behavioral intentions adds a level of precision to theory and practice that is currently missing in the literature (Banks, Woznyj, & Mansfield, 2021). Such information would have important implications for organizations to estimate the utility of financial incentives. Evidence indicates that the JND threshold for behavioral intentions tends to be larger than for magnitude and affect outcomes (e.g., Mitra et al., 2016). Thus, it stands to reason that the threshold for actual behavioral changes to occur could be even larger, which means that a pay raise may actually have to be substantially larger than the currently proposed 5%–7% (e.g., Mitra et al., 2016; 1997).

Third, and related, given the importance of outcomes such as creativity and the associated risk-taking behavior for organizational performance and competitiveness (Zhou & Shalley, 2011) in today's dynamic environment, the criterion space should expand even further. To test these types of effects, longitudinal designs are necessary, as we mentioned previously. In sum, we suggest that future research consider measuring "pure" behaviors, including in-role, creative, and risk-taking behaviors, to better understand the effects of varying JND thresholds.

CONCLUSION

Although compensation remains one of the most important tools for firms to motivate employees, within the field of management, compensation research is relatively scarce (Shaw & Gupta, 2015) and even fewer studies address the concept of JNDs in pay. We argue that an enhanced understanding of the JND threshold can turn compensation-related HRM activities into a strategic resource that gives an organization a competitive advantage. Conversely, a poor understanding of the JND threshold may result in organizations wasting their limited financial resources by awarding pay raises that are too small to be effective, or too large to be efficient. To spur new research in this important area, our study integrates and synthesizes the cross-disciplinary and fragmented JND literature. Specifically, we reviewed and integrated the general JNDs in pay literature, focusing on empirical research and emphasizing aspects such as JND thresholds used, types of JND outcome scales employed, and factors examined as antecedents, covariates, and outcomes of JNDs. To advance this literature, we also introduced a JND-focused framework that integrates expectancy and equity theories to examine antecedents for and effects of the JND threshold on job attitudes and behaviors. In terms of JND threshold antecedents, we highlight the role of individual differences, future expectations, social comparisons within job class, organizational and job

characteristics, and external environment characteristics. We hope that the current review and the framework proposed serve to stimulate research on new avenues for JNDs in pay research.

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Declarations

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Author Contributions

Conceptualization: GCB, AS, HMW, SK Data curation: GCB, AS, HMW Investigation: GCB, AS, HMW Formal Analysis: GCB, AS, HMW, SK Methodology: GCB, AS, HMW, SK Project administration: GCB Visualization: GCB, AS, HMW Writing original draft: GCB, AS, HMW Writing-review & editing: GCB, AS, HMW, SK