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Fair or Not Fair? The Effects of Numerical Framing on the Perceived Justice of Outcomes

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The authors draw on prospect theory and demonstrate that the perceived justice of an outcome is affected by the way numerical information is presented. Three experimental studies were conducted using five different samples, representing teachers, general employees, and future employees. People generally tend to see a bigger difference in the performance between the self versus another person when their performance components are presented in frames associated with small numbers (e.g., absence rate of 3% vs. 9%) than when they are presented in frames associated with large numbers (e.g., attendance rate of 97% vs. 91%). Despite the same objective performance difference (e.g., 6% in the above example), people expected different fair shares of rewards and evaluated justice of a given outcome differently across the two frames.

Keywords: *numerical framing; justice perceptions; distributive justice; prospect theory; reward allocation*

What affects perceptions of justice? This is a central question for organizational researchers (for reviews, see Colquitt, Conlon, Wesson, Porter, & Ng, 2001; Colquitt, Greenberg, &

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Zapata-Phelan, 2005; Cropanzano, Byrne, Bobocel, & Rupp, 2001) because justice perceptions are crucial for determining a wide variety of outcome variables in organizational contexts (e.g., Chen, Chen, & Xin, 2004; Kim & Mauborgne, 1995; Li, Bingham, & Umphress, 2007; Wade, O'Reilly, & Pollock, 2006). In this research, we propose and test the idea that contextual influence because of numerical framing (Kwong & Wong, 2006; Wong & Kwong, 2005a, 2005b) affects justice perceptions. The key idea is that when there is a reward allocation to a focal actor and other actors, the same input information (e.g., performance, contribution, etc.) will lead the focal actor to perceive the allocation to be more fair or less fair, depending on the numerical frames (small vs. large numbers) of the input information. The examination of numerical framing on justice perceptions contributes to the literature in three ways.

First, the current research adds to the growing interest in the study of subjectively experienced justice (Guo, Rupp, Weiss, & Trougakos, 2011; Weiss & Rupp, 2011). For example, van den Bos, Vermunt, and Wilke (1997) examined the effect of the temporal sequence of experiences on justice formation. They found a primacy effect, such that justice judgments are biased heavily by information that comes earlier than later (also see Lind, Kray, & Thompson, 2001).

Along this line of thought, scholars have also stressed that justice experience is influenced by contextual information that is instantly available (Folger & Cropanzano, 2001; Lind, 2001). Following the idea of simulation heuristic (Tversky & Kahneman, 1982), van den Bos and van Prooijen (2001) showed that the reference points evoked by the context (also known as referent cognitions in referent cognitions theory; see Folger & Cropanzano, 2001) will determine the evaluations of procedures. In another article, van den Bos (2002) noted that reactions toward different procedures depend on the comparison mindset (interpretation or comparison goals) triggered by subtle contextual cues (i.e., goal priming). We propose that this area of research can be advanced by investigating how justice perceptions are shaped by the way objective numerical information is subjectively understood and influences justice experience.

Second, the current research specifically contributes to the understanding of distributive justice by incorporating key ideas from the prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981, 1991). Traditionally, the exploration of distributive justice has been guided by the equity theory (Adams, 1965), which states that people judge an outcome by "assessing the ratio of their outcomes from and inputs to the relationship against the outcome/input ratio of a comparison other" (Huseman, Hatfield, & Miles, 1987: 222). Adams (1965) further stated that this judgment depends not only on the actual input and outcome received, but also on the cognitive (re)interpretation of these components. By distorting (altering) their subjective interpretation of inputs, people may report an otherwise inequitable outcome to be fair. In addition to cognitive distortion, findings have revealed that perceived distributive justice may also depend on the procedure used to derive the outcome. When procedural information is presented before rather than after outcome information, outcome judgments tend to assimilate toward the perceived justice of the procedure (e.g., van den Bos et al., 1997; also see fairness heuristics theory—Lind, 2001).

As we build on the above notion that distributive justice depends on factors other than the actual input or outcome, this research demonstrates that distributive justice is subject to the frame in which numerical information is presented. The key insight from prospect theory is

that objectively identical information, when framed differently (e.g., half empty or half full), will lead people to various interpretations and perceptions of the information. In our study, the numerical framing effect materializes because people do not interpret objective numbers consistently across numerical frames. This asymmetry in the interpretation is described succinctly by prospect theory, which is explained in detail in the next section. Unlike Adams's ideas on cognitive distortion and previous findings on the information presentation order reviewed above, the numerical framing effect emerges even when the objective inputs, outcomes, and the presentation order of information are held constant. Instead, by altering the framing of the numerical information, people may experience an outcome as more fair or less fair.

Third, the current research contributes to literature on numerical framing. One limitation of the original works on numerical framing (Wong & Kwong, 2005a, 2005b) is that a rater evaluates the performance of two ratees or options from a third-party perspective. However, people are generally self-serving, such that they often subjectively distort objective information in a way that is favorable to themselves (Bradley, 1978; Louie, 1999). Thus, the self-serving motive can possibly override the numerical framing effects because people will self-frame information that is favorable to themselves. In other words, whether the numerical framing is effective to self-relevant input performance is an empirical question that deserves further verification. We address this limitation by examining the consequences of numerical framing of input information on justice perceptions from a first-person perspective.

Below, we first provide a brief overview of numerical framing. This is followed by our hypotheses surrounding the numerical framing of justice perceptions. We then outline how the idea of numerical framing is related to but different from Adams's (1965) idea of cognitive distortion and other framing effects on justice perceptions (Brockner, Wiesenfeld, & Martin, 1995; Friedrich, Lucas, & Hodell, 2005). Finally, three studies (involving five samples) examining these hypotheses are presented.

Numerical Framing and Hypotheses

Numerical Framing and Prospect Theory

The numerical framing effect (Kwong & Wong, 2006; Wong & Kwong, 2005a, 2005b) refers to changes in the interpretation of numerical information when it is described in different but equivalent frames. When numerical information concerning two individuals (or objects) is presented in frames associated with small numbers (e.g., 10% vs. 20% absence rate), the two persons appear more different than when they are described in frames associated with large numbers (e.g., 90% vs. 80% attendance rate). In short, the same objective numerical difference (10% in the above example) may be interpreted as large or small depending on the numerical frame. Numerical framing draws on two major features of prospect theory, namely, frame of reference and diminishing sensitivity of the subjective value function (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981, 1991).

The idea of *frame of reference* in prospect theory highlights the fact that a situation can often be described in two different but equivalent frames: a positive frame (e.g., "a glass

half full") versus a negative frame (e.g., "a glass half empty"). There are plenty of examples of positive versus negative frames in real life, such as survival rate versus mortality rate of a medical treatment and acceptance rate versus rejection rate of an academic journal. By varying this frame of reference, people perceive the same situation as more attractive in a positive frame versus less attractive in a negative frame (Abelson & Levi, 1985; Highhouse & Paese, 1996). Wong and Kwong (2005a) extended the frame of reference idea to the context of performance evaluation, noting that the same level of performance can be framed differently (e.g., 93% attendance vs. 7% absence).

The *subjective value function* in prospect theory describes how we "feel or interpret" the meaning or utility of an objective number or quantity. The theory posits that the relationship between an objective quantity and its subjective utility follows an S-shaped function that is concave in the positive domain (i.e., above the reference point) and convex in the negative domain (i.e., below the reference point), as shown in Figure 1. Regardless of the domains, the marginal subjective value of a unit change (or the slope in the graph) diminishes as the objective value increases. For example, we will find that a gain of $10 is more pleasurable when our wealth increases from $10 to $20 than from $80 to $90. Likewise, the pain of losing $10 more is greater following a loss of $10 than following a loss of $80. The subjective value of a $10 gain or $10 loss is judged on a topical frame of the original wealth. As the absolute magnitude of the original wealth gets bigger, the same objective change is felt as less significant, that is, people become less sensitive. This diminishing sensitivity feature is prevalent in many sensory and perceptual judgments (Stevens, 1962), such as judgments of loudness (Stevens, 1936), brightness (Stevens, 1961), and weight perception (Engen, 1972; Gescheider, 1976).

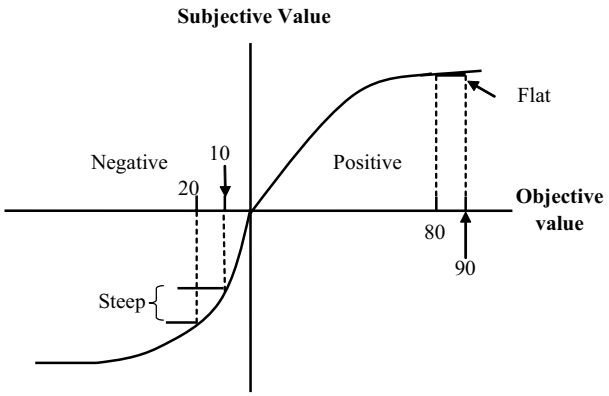
Numerical framing is presumably the result of these two major features. By changing the frame of reference, absence rates of 10% and 20% can be expressed in different but equivalent frames of attendance rates of 90% and 80%, respectively. Despite the equivalence in information, the diminishing sensitivity feature suggests that the perceived difference of the 10% between the two performance instances looms larger in the former pair than in the latter pair. The reason is that 10% and 20% fall on the steep part of the value function, whereas 80% and 90% are on the flat part of the function (see Figure 1). In sum, the same performance difference will appear larger when their numerical standings are expressed in a small number frame than when they are expressed in a large number frame.

Justice Perception and Numerical Framing

Researchers have conceptualized distributive justice under a general input–outcome framework, suggesting that employees often infer the input–outcome ratio by assessing the performance–pay ratio. Greenberg pointed out that

> the more people believe that their pay is based on their performance, the more fairly they believe they are paid (Heneman, 1984). This idea is consistent with equity theory (Adams, 1965) insofar as paying someone relative to his/her job performance, which is, in essence, providing outcomes in proportion to inputs, a necessary condition for equity to be established. (Greenberg, 2003: 43-44)

Figure 1
Subjective Value Function of Performance Standings



Source: Wong and Kwong (2005b, p. 56). Copyright 2005 by Elsevier. Adapted with permission.

Findings of numerical framing suggest that justice perceptions may depend on how input information is numerically framed because numerical framing determines the marginal change of this input comparison (e.g., Wong & Kwong, 2005a, 2005b). The perceived performance difference between oneself and another will be greater when their objective performance is presented with small numbers than when it is presented with large numbers. Thus, given the same reward, the person who performs worse will find the reward to be less fair when the input information is presented with a large number frame (which compresses the perceived performance difference) than when it is presented with a small number frame (which exaggerates the perceived performance difference).

To illustrate the effect of numerical framing on justice perceptions, assume that two employees, A and B, are evaluated in terms of punctuality. A has a poorer punctuality record (92% punctual or 8% late) compared to B (98% punctual or 2% late). Assume further that a manager gives A a year-end bonus of $250 and B $450, which is an allocation that is referred to as a negative-reward discrepancy for A. We argue that A would find the negative discrepancy in the bonuses less fair when punctuality is presented in a large number frame than when it is presented in a small number frame. The reason is that when punctuality is presented in a large number frame, that is, 92% punctual for A and 98% punctual for B, the two performance levels are on the flat part of the subjective value function and that they appear similar to each other (i.e., the flat slope part in Figure 1). A would not find himself or herself much inferior to B, and hence this should make the bonus allocations between A and B not equitable to the perceived performance difference. Conversely, when punctuality is presented in a small number frame, that is, 8% late for A and 2% late for B, the 6% difference now appears much larger because they fall on the steep part of the subjective value function (i.e., the steep slope part in Figure 1). The inferiority of A to B is exaggerated, which should make the negative bonus discrepancy seem more consistent with their relative performance standings in this situation.

As small number frames will exaggerate the perceived differences between two persons whereas large number frames will compress such differences, large (vs. small) number frames can help the inferior counterpart appear less inferior, whereas small (vs. large) number frames can help the superior counterpart appear more outstanding. Extending this logic to cases where two employees differ on two or more performance components with tradeoffs, they may evaluate a reward allocation very differently depending on how their performance is presented. More specifically, a person will appear as much more outstanding, deserving of better rewards when his or her superior performance components are expressed in small number frames whereas his or her inferior performance components are expressed in large number frames. This format is referred to as the favor-self presentation format because it makes self-performance more attractive. Alternatively speaking, the same person will appear less outstanding when his or her superior performance components are expressed in large number frames, whereas his or her inferior performance components are expressed in small number frames. This format is referred to as the favor-other presentation format because it makes other performance more attractive.

To illustrate how the favor-self versus favor-other presentation formats may alter perceived performance differences and hence the evaluation of reward allocation, consider the case of A and B again. Although A has a poorer punctuality record than does B, let us assume that A outperforms B in terms of attendance. Specifically, A has an attendance rate of 97% or absence rate of 3%, whereas B has an attendance rate of 93% or absence rate of 7%. Overall, A should find himself or herself no worse than B when his or her inferior performance component is expressed in a large number frame (i.e., A is 92% punctual and B is 98% punctual); meanwhile, his or her superior performance component is expressed in a small number frame (i.e., A has been absent from work for 3% of the time and B 7% of the time). The reason is that under this favor-self presentation format, A's inferiority to B in terms of punctuality will be compressed by the large numbers (which are on the flat part of the value function); at the same time, his or her superiority over B in attendance will be exaggerated by the small numbers (which are on the steep part of the value function). When A sees himself or herself no worse, if not better, than B, we can expect that he or she will find a negative reward discrepancy uncalled for and thus less fair.

On the contrary, A is more likely to believe that B is much better than himself or herself when A's inferior performance component is exaggerated by a small number frame (i.e., A is 8% late and B is 2% late) and A's superior performance component is compressed by a large number frame (i.e., A has shown up for work 97% of the time and B 93% of the time). Hence, under this favor-other presentation format, we can expect that A is more likely to see himself or herself worse than B and find a negative reward discrepancy more justified. To put our arguments formally, we hypothesize the following:

Hypothesis 1: People will find a negative discrepancy in reward allocation to be less fair when their performance information is presented in a favor-self format than when it is presented in a favor-other format.

A corollary prediction of the numerical framing effect is that people will form different expectations of their fair share of reward depending on how their performance is framed. Specifically, people will expect bigger shares of reward when their strong performance

component is amplified by a small number frame, whereas their weak performance component is moderated by a large number frame (i.e., favor-self presentation format). On the contrary, people will expect smaller shares of reward when their strong performance component is masked by a large number frame, whereas their inferior performance component is heightened by a small number frame (i.e., favor-other presentation format).

Hypothesis 2: People will expect bigger shares of reward when their performance information is presented in a favor-self format than when it is presented in a favor-other format.

Justice perceptions change across numerical frames because of diminishing sensitivity. People interpret the same performance difference as less important when the numbers associated with the performance standings increase. The perceived difference in the performance of two people is a function of the numerical frames; in turn, this perceived difference determines justice perceptions (Hypothesis 1) and expected fair rewards (Hypothesis 2). In other words, the effects of numerical framing predicted by Hypotheses 1 and 2 should be mediated by the perceived difference in performance levels.

Hypothesis 3: The effects of numerical framing on justice judgments are mediated by the perceived difference in the performance of the self versus that of the other.

We now contrast our ideas with some related works. Both the cognitive distortion argument from equity theory (Adams, 1965) and our arguments highlight the crucial role of subjective interpretation in justice perceptions. However, these two perspectives are markedly different in terms of their proposed mechanisms. The underlying assumption of the cognitive distortion argument is that people are motivated to restore equity. Thus, when faced with inequitable outcome, individuals may reinterpret or distort the objective information psychologically to rationalize the situation as equitable. This process operates much like cognitive dissonance reduction (Adams, 1965). On the contrary, our argument is not concerned with the motivation to restore seemingly inequitable outcomes but is rooted in basic judgment processes. As stated above, the asymmetry in the justice perceptions across numerical frames stems from the diminishing sensitivity of the S-shape subjective value function (e.g., Kahneman & Tversky, 1979). This nonlinear mapping between objective magnitude and subjective feeling is ingrained in basic perceptual judgment processes such as judgments of brightness or loudness (Stevens, 1962). Despite people's motivation to restore equity, we argue that one may experience low justice depending on the numerical frame. Our argument, if supported, may reflect that it is difficult to "willfully" distort information to fully adjust for the nonlinearity function inherent in judgment processes.

To the best of our knowledge, two articles have explored how the framing of information may influence fairness perceptions. First, Friedrich et al. (2005) showed that presenting university admission data in percentage or frequency frames could alter perceived fairness of and support for a change from race-conscious to race-neutral admission policy. In particular, because of the different base rates, the policy change would result in a bigger perceived impact on minority students when described in percentage frames than in frequency frames. This, in turn, made the proposed change appear less fair in percentage frames. Both our research and that of Friedrich et al. (2005) highlight that numerical data are objective but

could result in opposite justice perceptions when framed differently. However, the difference in base rates was necessary for the effect of percentage versus frequency frame to materialize in Friedrich et al. (2005; also see Yamagishi, 1997). On the other hand, the numerical framing effect proposed in the current research is more general because it is independent of the base rate (also see Kwong & Wong, 2006). Our idea also pinpoints situations where perceived fairness is subject to change even when data are described in percentage frames only.

Second, Brockner et al. (1995) manipulated the layoff decision to be positively framed as "keep employees" or negatively framed as "dismiss employees." They found that when procedural justice is low, the layoff is seen as more favorable when it is positively framed than when it is negatively framed. No such difference was found when procedural justice was high. The current research contributes beyond that of Brockner et al. (1995) by revealing how framing influences justice perceptions by altering perceptions of inputs rather than those of outcomes. In addition, the current research extends the examination of the framing effect on justice from the traditional attribute framing effect (i.e., positive vs. negative frames) to the more recent numerical framing phenomenon (see Levin, Schneider, & Gaeth, 1998, for different framing effects). This helps fill an important gap in the existing literature on justice perceptions.

We conducted three studies with five samples to test the hypotheses. In Studies 1a and 1b, we evaluated Hypothesis 1 by asking respondents to rate the justice of a reward allocation. In Studies 2a and 2b, we evaluated Hypothesis 2 by asking respondents to make fair reward allocations. In Study 3, we evaluated Hypothesis 3 by asking respondents to rate their performance, the performance of others, and their perceived fairness of an allocation decision. Across all studies, the respondents were presented with various performance components that show their performance and that of the others.

Study 1

In Study 1, we tested the hypothesis that presenting performance information with different numerical frames will alter the perceived fairness of the same reward allocation (Hypothesis 1). Consistent with the examples we have given, large number frames are typically associated with positive performance components (e.g., attendance of 80% vs. 90%; punctuality of 92% vs. 98%), whereas small number frames are typically associated with negative performance components (e.g., absence of 20% vs. 10%, lateness of 8% vs. 2%). To determine if the numerical framing effect generalizes no matter which kind of attributes (i.e., positive vs. negative) are used in conjunction with the large or small number frames, we conducted two studies. In Study 1a, positively framed information was associated with large numbers, whereas negatively framed information was associated with small numbers. The opposite pairing between framing and number sizes was used in Study 1b.

Study 1a: Method

Participants, procedure, and task. A total of 76 professional teachers from Hong Kong (34 males and 42 females) voluntarily participated in Study 1a. The mean age was 35.04 (SD = 9.88). On average, they had 10.7 (SD = 7.22) years of teaching experience.

Participants read the following scenario describing a reward allocation situation.

> Your school has a Western Orchestra Team and a Chinese Orchestra Team. You are the leader of the Western Orchestra Team, and Mr. Chan is the leader of the Chinese Orchestra Team. Because of a tight budget, both teams have a limited amount of musical instruments. The existing budget could support only 20 members for each team, though you have wanted to increase the team size.
>
> This year, the school received an extra fund of HK$100,000 to promote musical activities. The principal met with you and Mr. Chan to discuss how to allocate the funds. It was agreed that the fund allocation be contingent upon the performance of the two orchestra teams. In other words, more resources should be given to the team that has performed better. Accordingly, the principal considered two components indicating the teams' performance, namely, Inside School Performance and Outside School Performance.

Participants were given a table summarizing the performances of the two teams. The table indicated that the Western Orchestra Team performed better in inside school performance, whereas the Chinese Orchestra Team performed better in outside school performance (see Table 1). We created two versions of the performance table, which objectively shared identical information but were presented with different combinations of number sizes. The participants were randomly assigned to read one of the two versions. In the "favor-you" version, inside school performance was indicated by the students' absence rate during training (i.e., percentage of absence from the school orchestra training) over the past five years. This performance component was associated with small numbers (i.e., 4% for the Western Orchestra against 8% for the Chinese Orchestra). Meanwhile, outside school performance was indicated by the finalist rate (i.e., the percentage of the team getting into the finals in all kinds of interschool orchestra competitions) over the past 5 years. This performance component was associated with large numbers (i.e., 92% for the Western Orchestra against 96% for the Chinese Orchestra).

In the "favor-Chan" version, inside school performance was represented by the students' attendance rate during training (i.e., percentage of attendance during the school orchestra training) over the past 5 years. This performance component was associated with large numbers (i.e., 96% for the Western Orchestra against 92% for the Chinese Orchestra). On the other hand, outside school performance was indicated by the elimination rate (i.e., the percentage of the team being eliminated before getting into the finals in all kinds of interschool orchestra competitions) over the past 5 years. This performance component was associated with small numbers (i.e., 8% for the Western Orchestra and 4% for the Chinese Orchestra).

The participants were then informed that on the basis of the overall performance of the two orchestra teams, the principal decided to give Mr. Chan HK$70,000 for expanding the Chinese Orchestra Team and to give the participants the remaining HK$30,000 for expanding the Western Orchestra Team. The participants then rated their justice perceptions with respect to the principal's allocation decision on the basis of the given information. Justice perception was measured using a six-item scale ($\alpha = .84$) modified from the work of Price and Mueller (1986). This scale measures the degree to which the rewards received by the employees are perceived to be related to performance inputs on a 7-point Likert-type scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). This scale has been used in

Table 1
Performance Information on Western and Chinese Orchestra in Study 1a

	Condition			
	Favor You		Favor Chan	
	Western Orchestra (You) (%)	Chinese Orchestra (Chan) (%)	Western Orchestra (You) (%)	Chinese Orchestra (Chan) (%)
Inside school performance[a]	4	8	96	92
Outside school performance[b]	92	96	8	4

a. Inside school performance was expressed as "students' absence rate during training (i.e., percentage of absence from the school orchestra training) over the past five years" in the "favor-you" condition and was expressed as "students' attendance rate during training (i.e., percentage of attendance during the school orchestra training) over the past five years" in the "favor-Chan" condition.
b. Outside school performance was expressed as "finalist rate (i.e., percentage of the team getting into the finals in all kinds of inter-school orchestra competitions) over the past five years" in the "favor-you" condition and was expressed as "elimination rate (i.e., percentage of the team being eliminated before getting into the finals in all kinds of inter-school orchestra competitions) over the past five years" in the "favor-Chan" condition.

past research to measure distributive justice (e.g., Moorman, 1991). Example items include "The degree to which you believe that you are fairly rewarded on the basis of effort" and "The degree to which you believe that you are fairly rewarded on the basis of performance."

Study 1b: Method

Participants and design. A total of 80 respondents with full-time employment (45 males and 35 females) voluntarily participated in the study. The mean age was 29 (SD = 7.25). On average, they had 6.97 (SD = 6.04) years of work experience.

Participants read the following scenario describing a reward allocation situation.

> You and David are working in the same department of a firm. Both of you are responsible for the same tasks and duties. The firm conducts performance appraisal every year. The results of the appraisals are used to determine the amount of bonus employees will get at year end.
>
> This year, the firm made a good profit so employees can get a year-end bonus. Your supervisor was asked to allocate a total of HK$70,000 bonus between you and David on the basis of performance. The firm mentioned that performance should be evaluated by two equally important criteria: Understanding of the Firm's Workflow and Task Skills.

Participants were then presented with a table summarizing performance based on the two criteria. The table showed that the participants performed better in understanding, whereas David performed better in task skills (see Table 2). Participants were randomly assigned to read one of the two versions of the performance table. In the favor-you version, understanding was indicated by "percentage of jobs that *can* be completed without consulting others." This

Table 2
Performance Information in Study 1b

	Conditions			
	Favor You		Favor David	
	You (%)	David (%)	You (%)	David (%)
Understanding[a]	20	11	80	89
Task skills[b]	97	91	3	9

a. Understanding was expressed as the "percentage of jobs that *can* be completed without consulting others" in the "favor-you" condition and was expressed as "percentage of jobs that *cannot* be completed without consulting others" in the "favor-David" condition.
b. Task skills was expressed as the "percentage of jobs completed by an employee that *cannot* be immediately used without further modification" in the "favor-you" condition and was expressed as "percentage of jobs completed by an employee that *can* be immediately used without further modification" in the "favor-Chan" condition.

performance component was associated with small numbers (i.e., 20% for "you" vs. 11% for David). Task skills was indicated by "percentage of jobs completed by an employee that *cannot* be immediately used without further modification." This performance component was associated with large numbers (i.e., 97% for "you" and 91% for David).

In the "favor-David" version, understanding was indicated by "percentage of jobs that *cannot* be completed without consulting others." This performance component was associated with large numbers (i.e., 80% for "you" against 89% for David). Task skills was indicated by "percentage of jobs completed by an employee that *can* be immediately used without further modification." This performance component was associated with small numbers (i.e., 3% for "you" and 9% for David).

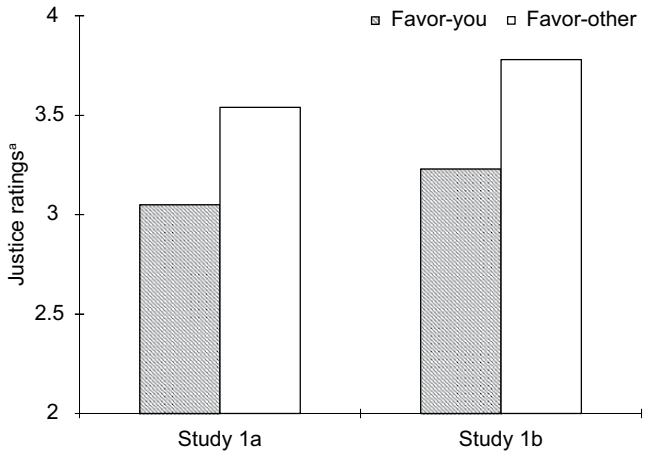
The participants were informed that on the basis of their overall performance, the supervisor decided to award them with HK$25,000, whereas David was awarded HK$45,000. They then rated their justice perceptions with respect to the supervisor's allocation decision using the six-item scale ($\alpha = .89$) used in Study 1a.

Results and Discussion

The results of Studies 1a and 1b are summarized in Figure 2. For both studies, justice ratings are lower in the favor-you condition than in the "favor-other" condition. That is, participants found the negative discrepancy in the funding allocation less fair in the favor-you condition. This pattern of results is observed regardless of whether large or small numbers are associated with positive or negative performance components.

This observation was confirmed by a 2 (condition: favor you vs. favor other) by 2 (study: 1a vs. 1b) analysis of variance (ANOVA). The main effect of condition was significant, $F(1, 152) = 7.01$, $MSE = 1.51$, $p < .01$, $\eta_p^2 = .04$, indicating that the mean justice rating in the favor-you condition (3.14) was significantly lower than that in the favor-other condition (3.66). The main effect of Study and the Condition × Study interaction was not significant,

Figure 2
Justice Ratings as a Function of Framing in Performance ("Favor You" vs. "Favor Other") in Studies 1a and 1b



a. Higher ratings indicate higher perceived justice.

*F*s < 1.12, $p > .27$. Separate analyses were then repeated for each study. The mean difference between the favor-you and the favor-other conditions was significant in Study 1a, $t(74) = 1.88$, $SE = 0.26$, $p < .05$, one-tailed, as well as in Study 1b, $t(78) = 1.89$, $SE = 0.29$, $p < .05$, one-tailed. These findings support Hypothesis 1.

We reran our analyses by entering gender as a covariate or as a third independent variable. We found that gender had no impact on the results reported in this study or those reported subsequently, and hence it is not discussed further.

The results from the two samples clearly show that the perceived fairness of a reward allocation can be altered when objectively identical performance information is described with different number sizes. Generally, people find a negative discrepancy in reward allocation to be less fair when their superior performance components are expressed with small numbers and their inferior performance components are expressed with large numbers (i.e., a favor-self format) than when their superior performance components are expressed with large numbers and their inferior performance components are expressed with small numbers (i.e., a favor-other format).

Study 2

In Study 2, we tested the corollary argument that people will form different expectations of their fair share of reward depending on the numerical frame of their performance information (Hypothesis 2). To ensure that our findings uphold across different pairings,

positively (negatively) framed information was associated with large (small) numbers in Study 2a, whereas opposite pairings were used in Study 2b.

Study 2a: Method

Participants, procedure, and task. A total of 78 professional teachers in Hong Kong (29 males and 49 females) voluntarily participated in this study. The mean age was 35.47 (*SD* = 8.72). On average, they had 11.78 (*SD* = 7.65) years of teaching experience.

All aspects of Study 2a were identical to those in Study 1a, except for the following changes in the scenario. First, the part about the principal's final allocation was dropped. Second, items measuring the perceived justice of the final allocation became irrelevant and were thus dropped. Finally, the participants were instead asked how the HK$100,000 fund should be fairly split between the two orchestra teams and to indicate the fair share of money (in dollars) that the Western Orchestra Team should receive.

Study 2b: Method

Participants, procedure, and task. A total of 80 respondents currently employed (44 males and 36 females) voluntarily participated in Study 2b. The mean age was 28.5 (*SD* = 8.11). On average, they had 6.61 (*SD* = 6.56) years of work experience.

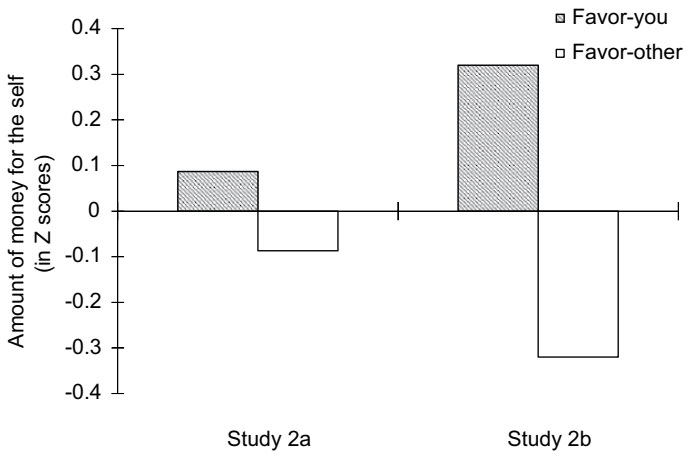
All aspects of Study 2b were identical to those of Study 1b, except for the following changes in the scenario. First, the part about the supervisor's allocation decision was dropped. Second, the justice items were dropped. Finally, the participants were asked how the HK$70,000 bonus should be split fairly between David and themselves and to indicate their fair share of the bonus (in dollars).

Results and Discussion

As the dependent variables used in Studies 2a and 2b incorporated different response scales, we transformed the dollar values into *z* scores for each study. The results of Studies 2a and 2b are summarized in Figure 3. Participants expected to receive a bigger share of the money in the favor-you condition than in the favor-other condition. This pattern of results appears to be stronger in Study 2b than in Study 2a.

This observation was generally consistent with the results revealed by a 2 (condition: favor-you vs. favor-other) by 2 (study: 2a vs. 2b) ANOVA. The main effect of condition was significant, $F(1, 154) = 7.02$, $MSE = 0.95$, $p < .01$, $\eta_p^2 = .04$, indicating that the mean in the favor-you condition (0.21) was significantly larger than the mean in the favor-other condition (–0.21). The Condition × Study interaction was not significant, $F(1, 154) = 2.34$, $p > .13$, indicating that there was no evidence that the effect of framing was stronger in Study 2b than in Study 2a. However, when separate analyses were conducted for each study, the mean difference between the favor-you and favor-other conditions was not significant in

Figure 3
Amount of Money for the Self (expressed as a *z* score) as a Function of Framing in Performance ("Favor You" vs. "Favor Other") in Studies 2a and 2b



Study 2a, $t(76) = 0.77$, $p > .05$, but was significant in Study 2b, $t(78) = 3.05$, $SE = 0.21$, $p < .01$, one-tailed.

The results from the two studies are generally consistent with Hypothesis 2, wherein people expect to receive a different share of the reward depending on how performance information is described. Specifically, they expect a bigger share of reward when their superior (inferior) performance component is presented with small (large) numbers, as in the favor-self condition, than when it is presented with large (small) numbers, as in the favor-other condition.

Study 3

In Study 3, we tested the hypothesis that the effects of numerical framing are mediated by the perceived performance difference between the self and the other (Hypothesis 3). To accomplish the task, we asked participants to rate their own performance and that of another before giving justice ratings.

Notably, the effects of numerical framing in Study 2a were quite weak when small numbers were paired with a negative performance component and large numbers were paired with a positive performance component. The fact that people are more sensitive to negatively framed information (Dunegan, 1993) and are more accurate in handling smaller numbers (Moyer & Landauer, 1967) may explain why the numerical framing effect appears weaker with such a combination. To affirm the generality of the numerical framing effects, Study 3 tested the influence of numerical framing on justice perceptions in another context with the same pairing of number size and attribute frame as that in Study 2a.

One limitation in Studies 1 and 2 concerns the use of scenario-based methods without any real consequence. To address this limitation, we conducted a laboratory study in which participants were given a monetary reward according to their performance relative to the other participants.

Method

Participants and design. A total of 68 undergraduate students (36 males and 32 females) voluntarily participated in Study 3. The mean age was 20.84 (*SD* = 1.44). The experiment was conducted in groups of 10 participants in a laboratory.

Each participant was given an identity number on arrival at the laboratory. Participants were told that their task was to circle all instances of the letter *e* in a passage consisting of about 250 words. They had 1 minute to complete the task. This task was chosen because of the difficulty in achieving a perfect, error-free performance (known as the word inferiority effect; Healy & Drewnowski, 1983). Participants were informed that they would be rewarded HK$20 to HK$100 according to their performance, which is relative to a partner randomly assigned to them. However, in reality, there was no such partner. The groups of participants started and ended the task at the same time. Their worksheets were collected and graded.

Each participant was then brought to another room to individually meet an experimenter and to receive his or her results. Participants were told that this experimenter would inform them about their own performance, their partner's performance, and the amount of reward they would receive. In the meeting, the experimenter showed a table with the handwritten results, leading participants to believe that there was a real partner to whom their performance would be compared. All participants received the same performance results for themselves and for their partners and the same amount of reward regardless of their actual performance.

Numerical framing was manipulated through the handwritten results table. In the small number conditions, the table described their performances in terms of missing rate, and 5% was given to the participants compared to the 2% for the partner. In the large number conditions, their performances were described in terms of the detection rate, with 95% for the participants and 98% for their partners. Participants were randomly assigned to one of these two conditions. In either case, participants were told that according to their relative performance, they would receive HK$30, whereas their partners would receive HK$50.

Participants were then invited to go to the next room where another experimenter would give them the monetary reward. In the next room, the experimenter asked participants to complete a questionnaire. Participants first rated their own performance and that of their partner, respectively, on a 7-point scale ranging from 1 (*poor*) to 7 (*excellent*). The perceived difference in performance was computed by subtracting the partner's rating from that of the participant (ranging from –6 to 6), with higher scores indicating that the participant was much better than the partner. They then evaluated the fairness of the reward allocation using the justice perception scale used in Study 1 ($\alpha = .88$).

The experiment ended at this point. Participants were then thanked and debriefed. At the very beginning of the study, participants were informed that their rewards would be contingent on their performance. Despite the above deception to achieve our manipulation,

Table 3
Performance and Justice Ratings as a Function of Condition in Study 3

	Condition							
	Small Number				Large Number			
	Self		Partner		Self		Partner	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Performance rating	3.36	1.11	5.24	1.06	4.23	1.17	4.83	1.34
Justice rating	4.01	1.16			3.27	1.15		

we checked their actual performance. The best performer(s) in each group were given HK$100 in total, and the second and the third best were each given HK$50 in total. These rewards were given in front of the group at the end of the experiment.

Results and Discussion

Table 3 summarizes the results of Study 3. A 2 (condition: small number vs. large number) by 2 (performance rating: self vs. partner) ANOVA with performance rating as the repeated measure variable yielded a significant interaction, $F(1, 66) = 12.39$, $MSE = 1.12$, $p < .01$, $\eta_p^2 = .16$. This result indicates that participants gave significantly lower ratings to themselves than to their partners in the small number condition (3.36 vs. 5.24), $t(32) = 7.66$, $p < .01$. However, this rating difference was markedly reduced in the large number condition (4.23 vs. 4.83), although it remains statistically significant, $t(34) = 2.25$, $p < .05$. This interaction pattern clearly indicates that the numerical frame exaggerates the performance superiority of the partner over the self in the small number condition compared to that in the large number condition. This change in perception emerges even when this bears real consequences on participants' own monetary reward.

To test Hypothesis 3, that the numerical framing effect on justice ratings is mediated by the perceived performance difference between the self and the partner, we followed the method of Baron and Kenny (1986) and conducted hierarchical regression analyses with justice rating as the dependent variable.[1] The means, standard deviations, and intercorrelations of the variables are presented in Table 4. The results of the hierarchical regression analyses that tested the mediation hypothesis are presented in Table 5. Model 1 shows that the effect of condition (small number vs. large number) was significant, $\beta = -.33$, $p < .01$, supporting Hypothesis 1. This result also clarifies that the effect of numerical frame still holds when a small number frame is paired with a negative performance component, thereby eliminating the concern for its generality. Model 2 shows a significant R^2 change ($\Delta R^2 = .06$, $p < .05$) when a self–other performance difference rating was added to the model. The performance difference rating was positively related to the perceived justice of the reward allocation, $\beta = .26$, $p < .05$. More importantly, the effect of condition was no longer significant in Model 2, $\beta = -.22$, $p > .05$. This result suggests that the effect of condition was mediated by perceived differences in performance. The Sobel test indicates that the drop in the effect of condition was significant, $Z = 1.80$, $p < .05$, one-tailed, supporting Hypothesis 3.

Table 4
Means, Standard Deviations, and Intercorrelations of the Variables in Study 3

Variable	*M*	*SD*	1	2	3	4	5
1. Condition (0 = *small number*, 1 = *large number*)	0.51	0.50	—				
2. Performance rating on self (1 to 7)	3.81	1.21	–.36**	—			
3. Performance rating on partner (1 to 7)	5.03	1.22	–.17	.12**	—		
4. Perceived self-other difference (–6 to 6)	–1.22	1.62	.40**	.66**	–.67**	—	
5. Justice rating (1 to 7)	3.65	1.21	–.33**	–.12	.34**	–.35**	—

**$p < .01$

Table 5
Results of Hierarchal Multiple Regression (in standardized beta values) in Study 3

	Model 1	Model 2	Model 3	Model 4
Independent variable				
Condition (0 = *small number*, 1 = *large number*)	–.33**	–.22	–.32*	–.28*
Mediating variables				
Perceived self–other difference in performance		.26*		
Performance rating on self			–.01	
Performance rating on partner				.29*
ΔR^2		.06	.00	.08
F change		4.38*	0.00	6.57*
Overall model R^2	.11	.16	.11	.19
Adjusted R^2	.09	.14	.08	.16
Overall model *F*	7.91**	6.35**	3.90*	7.58**

Note: The dependent variable is justice rating.
*$p < .05$. **$p < .01$.

As the mediator involved difference score ratings, it is important to examine whether the mediation effects were driven mainly by one of the two ratings or by both components (Edwards, 1995). We examined two regression models (see Models 3 and 4 in Table 5), with only one of the rating components as the mediator. The results showed that the effects of condition remained significant when either rating was added to the regression model. That is, the mediating effect of the perceived performance difference cannot be attributed solely to either one of the ratings.

General Discussion

Summary of Findings

Through three studies, we showed that perceived justice of an outcome is influenced by the way numerical information is presented (in small vs. large numbers). Studies 1a and 1b

demonstrated that people perceived a negative discrepancy in reward allocation to be less fair when their superior performance components were presented with small rather than large numbers and also when their inferior performance components were expressed in large rather than small numbers. Studies 2a and 2b showed that numerical framing affects the expected fair share of reward in a similar fashion. Study 3 revealed that the difference in input perception (i.e., perceived self–other difference in performance) mediated the effects of numerical framing on justice perceptions.

Theoretical Implications

The present research examines the subjectivity of justice perceptions (Guo et al., 2011) through a prospect theory lens (Kahneman & Tversky, 1979). The current results reinforce the idea that justice perception is subject to subtle contextual influences (Cropanzano et al., 2001; Folger & Cropanzano, 2001; van den Bos, 2002) and specifies numerical framing as one such contextual factor. In assessing equity, people may not always thoroughly deliberate on the information at hand. Instead, they may process the information according to how it is framed. More importantly, our studies show that people are not motivated to convert information into alternative numerical frames even when the information has a direct implication on their self-perceptions and/or real consequences on the monetary rewards they can receive. These findings echo the viewpoint of Cropanzano et al. (2001: 198) that justice judgments do not necessarily result from deliberative, effortful cognitive processing.

These contextual influences on justice perceptions also extend our understanding of distributive justice beyond previous theoretical frameworks. Both equity theory (Adams, 1965; Huseman et al., 1987) and fairness heuristics theory (Lind, 2001) note that the perceived justice of an outcome can be determined by factors other than the actual input and outcome, including cognitive distortion and the procedure used to derive the outcome. By integrating ideas from prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981, 1991), the present research adds numerical framing to this list. People find that the same objective performance difference is less significant when the information is framed with large numbers versus small numbers, most likely because of the diminishing sensitivity of the subjective value function. This asymmetry in the subjective differences across numerical frames leads to differences in the perceived justice of an outcome as well as different expectations about the fairness of rewards.

The current research extends the findings of numerical framing by showing its generality in two ways. First, it addresses the concern that the numerical framing effect may be trumped by self-interest. Our findings showed, across three studies and five samples, that numerical framing is effective even when the information is self-relevant and is associated with real consequences.

Second, previous numerical framing studies (Kwong & Wong, 2006; Wong & Kwong, 2005a, 2005b) were limited to showing the effects on information directly under manipulation. The present study demonstrates that numerical framing effects are not limited to the perception of information directly manipulated (e.g., input information) but can generalize to perceptions that have to be inferred from the manipulated information (e.g., justice

perceptions). Putting these two points together, we believe that numerical framing is a robust effect.

Finally, the present research responds to the call for more intellectual exchanges among the fields of judgment and decision making (JDM) and industrial-organizational psychology and organizational behavior (IOOB; Dalal et al., 2010; Highhouse, 2001; Moore & Flynn, 2008). Although the methodological traditions of JDM and IOOB may vary (see Rosen, Shuffler, & Salas, 2010; Staw, 2010), scholars have advocated that differences such as these should not be regarded as a barrier to the integration of these fields (e.g., Bonaccio et al., 2010; Reb, 2010). The reason is that judgments, decisions, and choices are an integral part of many IOOB topics (e.g., justice judgments, selection and promotion decisions), and many of the basic processes identified in JDM are possibly hardwired in human minds; hence, it is reasonable to believe that they may also affect key constructs in organizational studies (Dalal et al., 2010). Some of these basic processes, such as numerical framing, as well as other phenomena uncovered by JDM research (e.g., Brockner et al., 1995; Friedrich et al., 2005; Reb & Cropanzano, 2007; Slaughter, Sinar, & Highhouse, 1999; Wong & Kwong, 2007b), have offered opportunities for organizational researchers to gain a better understanding of IOOB topics and to introduce new practices and interventions to managers.

The present research, along with that of Brockner et al. (1995) and Friedrich et al. (2005), demonstrates that framing, which is a robust phenomenon documented in JDM, plays an important role in justice experience. Brockner et al. (1995) found that perceived fairness could be a matter of framing the outcomes to be positive or negative, thereby altering justice perceptions. Friedrich et al. (2005) showed that the perceived fairness and acceptance of social policy change when data are described in terms of frequency instead of percentage. Complementarily, we show that the framing of input information with large or small numbers can alter justice perceptions. Taken together, these works illustrate how organizational studies can be enriched by incorporating ideas from the JDM. Nonetheless, maintaining high external validity in research design is also crucial to the integration of the fields (Rosen et al., 2010; Staw, 2010).

Practical Implications

Our findings are particularly relevant to managers when employees might be sensitive to distributive justice. Given that numerical framing affects the extent to which people judge an outcome as fair, we second the recommendation of Wong and Kwong (2005a: 292) that whether to present performance information "with a large number or a small number is not just a matter of convenience or convention." Rather, a match between performance information display and allocation systems can reduce the chances that the allocation system would be deemed unjust.

Organizations might consider aligning the frame of performance criteria with their preference for resource allocation. Organizations that endorse less differentiated allocation might consider presenting performance criteria in frames that are often associated with large numbers (e.g., success rate, accuracy rate, hit rate, etc.). In this way, employees are less likely to see much differentiation among their peers and themselves. This helps justify the

similarity in their salaries or bonuses. In contrast, organizations that employ more differentiated allocation might consider presenting the criteria in frames that are often associated with small numbers (e.g., failure rate, error rate, missing rate, etc.). Such a presentation would help employees see the differences in the performance of the self versus that of the others and hence appreciate the reasons for more diverse allocations. Thus, to the extent that the reward system of an organization is performance-based, the framing of performance criteria should be carefully considered.

In a recent discussion, scholars of organizational justice have called for conducting intervention studies that are designed to assess the efficacy of various techniques for helping promote justice in organizational practices (Greenberg, 2009). Our suggestion above should be further validated accordingly. In addition, Barclay, Skarlicki, and Latham (2009) highlighted that designing techniques that help employees to cope with injustice is equally important. For instance, Barclay and Skarlicki (2009) found that expressive writing has psychological benefits for employees to deal with workplace injustice (e.g., reported less anger). Our results offer an additional technique that may be useful to help employees cope with the feeling of injustice. Specifically, our results suggest that a possible reason for employees' feeling of injustice is that they may have selectively attended to a "mismatched" reward–performance pairing. Thus, a possible way to reduce the bad feeling is to direct the employees' attention to the alternative pairing. Consider the following example that is modified from a scenario that one of the authors overheard in a public area:

> One day, there was a salesman talking with his friend about the reward his boss allocated to him for his contribution to the boss' team. The salesman compared the relative amount he received and his relative contribution to the team. He then concluded, "The allocation was unfair. I got $500 and David got $400. The official sales record shows that I missed 11% of the duties my boss assigned to me. David, my teammate, missed 20%, almost double my shortcoming. How come the amount of his reward was so close to mine?" The salesman's friend comforted him, saying, "It may not be as unfair as you think. Try to understand the allocation from a different perspective. That is, you completed 89% of missions and David completed 80%. David's performance, in terms of completion rate, is not too far from yours. From this perspective, if I were David, I would think the allocation was unfair to me."

We believe that by introducing the possibility of interpreting the same outcomes from different frames, employees may better appreciate issues from different perspectives and hence understand the reason why supervisors did not give them a share of the reward they had expected. This suggestion warrants empirical validation.

Limitations and Future Research Directions

The present research involved three studies with highly controlled experimental contexts that enabled us to isolate confounding factors and provide strong evidence in terms of causality. This approach was anchored on the recommendation that internal validity is important at the initial stage of understanding a phenomenon (e.g., Shadish, Cook, & Campbell, 2002). However, the manipulation employed in our studies would be difficult, if

not infeasible, to implement in naturalistic settings. For example, there would be ethical and perhaps legal concerns on the manipulations of performance information display with random assignment because employees may complain about the sudden change in performance criteria—for instance, employees may question why they are now being evaluated on the basis of absence rate instead of attendance rate. Although the two criteria are essentially two sides of a coin, employees may expect elaborate justification from the organization before such changes are implemented.

Nonetheless, we second the idea of Staw (2010) that external validity is crucial to the successful integration of JDM works with IOOB. To address this concern, we used samples with diverse organizational experience (e.g., professional teachers, general employees) and scenarios that were familiar to participants. We also conducted experiments with real consequences, and the consistent results across all three studies suggest that our findings should generalize to real-world settings and warrant empirical testing by field studies.

Future research may examine the idea of the present research to other applied contexts such as public policy. Specifically, we believe that numerical framing could be a powerful tool for influencing the perceived justice of public policy that uses numerical criteria to allocate resources. For example, financial support for public universities is often partly determined by the university performance in a wide variety of components that can frequently be described by different numerical frames (e.g., percentage of PhD faculty vs. percentage of non-PhD faculty, students' employment vs. unemployment rate, research grant success rate vs. failure rate, etc.). Therefore, future research can test the prediction that a presentation of the funding allocation decisions along with carefully chosen numerical frames may increase perceived justice among both university employees as well as taxpayers.

Furthermore, it is important that future studies examine individual, interorganizational, and cross-cultural differences in terms of the effects of numerical framing on justice perceptions because fairness has been shown to be defined differently by different groups and within different contexts (DeVoe & Iyengar, 2010; Ng, 1984). For example, equity (vs. equality) is likely to be used to represent fairness for out-group (vs. in-group) members in resource allocation (Ng, 1984), performance evaluation (Wang, Wong, & Kwong, 2010; Wong & Kwong, 2007a) and exchanges of monetary rewards (DeVoe & Iyengar, 2010). We expect that the numerical framing effect found in the present research will be weaker for equality fairness than for equity fairness because input comparisons are less relevant in the contexts that emphasize equality. We encourage researchers to verify this prediction because it points to the boundary conditions of numerical framing effects on justice perceptions.

Future research may also examine how justice perceptions are shaped by other cognitive biases or psychophysical characteristics. As Study 3 reveals, numerical framing works because it alters the perceived difference between two objective performances. In other words, other cognitive biases in JDM research that have been shown to alter perceived similarity and difference are likely to induce similar effects on justice perceptions. For example, in addition to numerical framing, Wong and Kwong (2005b) reviewed three other possible ways that may alter the perceived differences between identical objects, including decoy effects (Highhouse, 1996), changes in evaluation scales to be choice or ratings (Lichtenstein & Slovic, 1971; Tversky, Sattath, & Slovic, 1988), and whether options are

evaluated separately or jointly (Bazerman, Loewenstein, & White, 1992; Hsee, Loewenstein, Blount, & Bazerman, 1999). Future research may examine what effects these will have on justice perceptions.

Finally, justice and injustice are not necessarily the two ends of a continuum. Greenberg (1987) proposed that injustice is associated with reactions such as escaping from or avoiding unfair states, whereas justice is associated with proactive behaviors that promote and create fair states (also see Rupp & Bell, 2010, for a discussion of prevention and promotion within the context of justice). Thus, a straightforward and interesting extension of the present research is to investigate whether the same patterns of findings can be found when justice is framed as injustice.

Note

1. Recently, there have been some active discussions on testing mediation using experiments instead of Baron and Kenny's (1986) correlational method (Bullock, Green, & Ha, 2010; Spencer, Zanna, & Fong, 2005). However, some of these recommendations could not be applied in Study 3 because the mediator was not experimentally manipulated in Study 3. Bullock et al. (2010) note that the problem of not experimentally manipulating the mediator could not be solved by recently developed statistical techniques such as bootstrapping and structural equation modeling. Thus, we simplified the mediation analysis by following the traditional Baron and Kenny method. Nonetheless, we acknowledge that the current design does not rule out the concern that an omitted variable influenced both the mediator and the dependent variable.

References

Abelson, R. P., & Levi, A. 1985. Decision making and decision theory. In G. Lindzey & E. Aronson (Eds.), *Handbook of social psychology:* 231-309. New York: Random House.

Adams, J. S. 1965. Inequity in social exchange. In E. E. Jones & K. E. Davis (Eds.), *Advances in experimental social psychology:* 267-299. New York: Academic Press.

Barclay, L., & Skarlicki, D. P. 2009. Healing the wounds of organizational injustice: Examining the benefits of expressive writing. *Journal of Applied Psychology*, 94: 511-523.

Barclay, L. J., Skarlicki, D. P., & Latham, G. P. 2009. Greenberg doth protest too much: Application always has been, and victims and morality always will be critical for advancing organizational justice research. *Industrial and Organizational Psychology: Perspectives on Science and Practice*, 2: 201-204.

Baron, R. M., & Kenny, D. A. 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51: 1173-1182.

Bazerman, M. H., Loewenstein, G. F., & White, S. B. 1992. Reversals of preference in allocation decisions: Judging an alternative versus choosing among alternatives. *Administrative Science Quarterly*, 37: 220-240.

Bonaccio, S., Dalal, R. S., Highhouse, S., Ilgen, D. R., Mohammed, S., & Slaughter, J. E. 2010. Taking workplace decisions seriously: This conversation has been fruitful! *Industrial and Organizational Psychology: Perspectives on Science and Practice*, 3: 455-464.

Bradley, G. W. 1978. Self-serving biases in the attribution process: A reexamination of the fact or fiction question. *Journal of Personality and Social Psychology*, 36: 56-71.

Brockner, J., Wiesenfeld, B. M., & Martin, C. L. 1995. Decision frame, procedural justice, and survivors' reactions to job layoffs. *Organizational Behavior and Human Decision Processes*, 63: 59-68.

Bullock, J. G., Green, D. P., & Ha, S. E. 2010. Yes, but what's the mechanism? (Don't expect an easy answer). *Journal of Personality and Social Psychology*, 98: 550-558.

Chen, C. C., Chen, Y. R., & Xin, K. 2004. Guanxi practices and trust in management: A procedural justice perspective. *Organization Science*, 15: 200-209.

Colquitt, J. A., Conlon, D. E., Wesson, M. J., Porter, C. O. L. H., & Ng, K. Y. 2001. Justice at the millennium: A meta-analytic review of 25 years of organizational justice research. *Journal of Applied Psychology*, 86: 425-445.

Colquitt, J. A., Greenberg, J., & Zapata-Phelan, C. P. 2005. What is organizational justice? A historical overview. In J. Greenberg & J. Colquitt (Eds.), *Handbook of organizational justice:* 3-56. Mahwah, NJ: Lawrence Erlbaum.

Cropanzano, R., Byrne, Z. B., Bobocel, D. R., & Rupp, D. E. 2001. Moral virtues, fairness heuristics, social entities, and other denizens of organizational justice. *Journal of Vocational Behavior*, 58: 164-209.

Dalal, R. S., Bonaccio, S., Highhouse, S., Ilgen, D. R., Mohammed, S., & Slaughter, J. E. 2010. What if Industrial-organizational psychology decided to take workplace decisions seriously? *Industrial and Organizational Psychology: Perspectives on Science and Practice*, 3: 386-405.

DeVoe, S. E., & Iyengar, S. S. 2010. Medium of exchange matters: What's fair for goods is unfair for money. *Psychological Science*, 21: 159-162.

Dunegan, K. J. 1993. Framing, cognitive modes, and image theory: Toward an understanding of a glass half full. *Journal of Applied Psychology*, 78: 491-503.

Edwards, J. R. 1995. Alternatives to difference scores as dependent variables in the study of congruence in organizational research. *Organizational Behavior and Human Decision Processes*, 64: 307-324.

Engen, T. 1972. Psychophysics: I. discrimination and detection. In J. W. Kling & L. A. Riggs (Eds.), *Woodworth and Schlosberg's experimental psychology:* 11-46. New York: Holt, Rinehart & Winston.

Folger, R., & Cropanzano, R. 2001. Fairness theory: Justice as accountability. In J. Greenberg & R. Cropanzano (Eds.), *Advances in organizational justice:* 1-55. Stanford, CA: Stanford University Press.

Friedrich, J., Lucas, G., & Hodell, E. 2005. Proportional reasoning, framing effects, and affirmative action: Is six of one really half a dozen of another in college admissions? *Organizational Behavior and Human Decision Processes*, 98: 195-215.

Gescheider, G. A. 1976. Evidence in support of the duplex theory of mechanoreception. *Sensory Processes*, 1: 68-76.

Greenberg, J. 1987. A taxonomy of organizational justice theories. *Academy of Management Review*, 12: 9-22.

Greenberg, J. 2003. Creating unfairness by mandating fair procedures: The hidden hazards of a pay-for-performance plan. *Human Resource Management Review*, 13: 41-57.

Greenberg, J. 2009. Everybody talks about organizational justice, but nobody does anything about it. *Industrial and Organizational Psychology: Perspectives on Science and Practice*, 2: 181-195.

Guo, J., Rupp, D., Weiss, H., & Trougakos, J. 2011. Organizational justice: A person-centric model of organizational justice. In S. W. Gilliland, D. D. Steiner, & D. P. Skarlicki (Eds.), *Emerging perspectives on organizational justice and ethics: Research in social issues in management* (Vol. 7): 3-32. Greenwich, CT: Information Age.

Healy, A. F., & Drewnowski, A. 1983. Investigating the boundaries of reading units: Letter detection in misspelled words. *Journal of Experimental Psychology: Human Perception and Performance*, 9: 413-426.

Heneman, R. L. 1984. *Pay for performance: Exploring the merit system*. New York: Pergamon.

Highhouse, S. 1996. Context-dependent selection: The effects of decoy and phantom job candidates. *Organizational Behavior and Human Decision Processes*, 65: 68-76.

Highhouse, S. 2001. Judgment and decision-making research: Relevance to industrial and organizational psychology. In N. Anderson, D. S. Ones, H. K. Sinangil, & C. Viswesvaran (Eds.), *Handbook of industrial, work, and organizational psychology, volume 2: Organizational psychology:* 314-331. London: Sage.

Highhouse, S., & Paese, P. W. 1996. Problem domain and prospect frame: Choice under opportunity versus threat. *Personality and Social Psychology Bulletin*, 22: 124-132.

Hsee, C. K., Loewenstein, G. F., Blount, S., & Bazerman, M. H. 1999. Preference reversals between joint and separate evaluations of options: A review and theoretical analysis. *Psychological Bulletin*, 125: 576-590.

Huseman, R. C., Hatfield, J. D., & Miles, E. W. 1987. A new perspective on equity theory: The equity sensitivity construct. *Academy of Management Review*, 12: 222-234.

Kahneman, D., & Tversky, A. 1979. Prospect theory: An analysis of decision under risk. *Econometrica*, 47: 263-292.

Kim, W. C., & Mauborgne, R. A. 1995. A procedural justice model of strategic decision-making: Strategy content implications in the multinational. *Organizational Science*, 6: 44-61.

Kwong, J. Y. Y., & Wong, K. F. E. 2006. The role of ratio differences in the framing of numerical information. *International Journal of Research in Marketing*, 23: 385-394.

Levin, I. P., Schneider, S. L., & Gaeth, G. J. 1998. All frames are not created equal: A typology and critical analysis of framing effects. *Organizational Behavior and Human Decision Processes*, 76: 149-188.

Li, H. Y., Bingham, J. B., & Umphress, E. E. 2007. Fairness from the top: Perceived procedural justice and collaborative problem solving in new product development. *Organization Science*, 18: 200-216.

Lichtenstein, S., & Slovic, P. 1971. Reversals of preference between bids and choices in gambling decisions. *Journal of Experimental Psychology*, 89: 46-55.

Lind, E. A. 2001. Fairness heuristic theory: Justice judgments as pivotal cognitions in organizational relations. In J. Greenberg & R. Cropanzano (Eds.), *Advances in organizational justice:* 56-88. Stanford, CA: Stanford University Press.

Lind, E. A., Kray, L., & Thompson, L. 2001. Primacy effects in justice judgments: Testing predictions from fairness heuristic theory. *Organizational Behavior and Human Decision Processes*, 85: 189-210.

Louie, T. A. 1999. Decision makers' hindsight bias after receiving favorable and unfavorable feedback. *Journal of Applied Psychology*, 84: 29-41.

Moore, D. A., & Flynn, F. J. 2008. The case for behavioral decision research in organizational behavior. *Academy of Management Annals*, 2: 399-431.

Moorman, R. H. 1991. Relationship between organizational justice and organizational citizenship behaviors: Do fairness perceptions influence employee citizenship? *Journal of Applied Psychology*, 76: 845-855.

Moyer, R. S., & Landauer, T. K. 1967. Time required for judgments of numerical inequality. *Nature*, 215: 1519-1520.

Ng, S. H. 1984. Intergroup allocation bias before and after group discussion. *Journal of Social Psychology*, 124: 95-103.

Price, J. L., & Mueller, C. W. 1986. *Handbook of organizational measurement*. Marshfield, MA: Pittman.

Reb, J. 2010. Integrating IOOB and JDM through process-oriented research. *Industrial and Organizational Psychology: Perspectives on Science and Practice*, 3: 445-447.

Reb, J., & Cropanzano, R. 2007. Evaluating dynamic performance: The influence of salient gestalt characteristics on performance ratings. *Journal of Applied Psychology*, 92: 490-499.

Rosen, M. A., Shuffler, M., & Salas, E. 2010. How experts make decisions: Beyond the JDM paradigm. *Industrial and Organizational Psychology: Perspectives on Science and Practice*, 3: 438-442.

Rupp, D. E., & Bell, C. M. 2010. Extending the deontic model of justice: Moral self-regulation in third-party responses to injustice. *Business Ethics Quarterly*, 20: 89-106.

Shadish, W. R., Cook, T. D., & Campbell, D. T. 2002. *Experimental and quasi-experimental designs for generalized causal inference*. Belmont, CA: Wadsworth/Cengage.

Slaughter, J. E., Sinar, E. F., & Highhouse, S. 1999. Decoy effects and attribute-level inferences. *Journal of Applied Psychology*, 84: 823-828.

Spencer, S. J., Zanna, M. P., & Fong, G. T. 2005. Establishing a causal chain: Why experiments are often more effective than mediational analyses in examining psychological processes. *Journal of Personality and Social Psychology*, 89: 845-851.

Staw, B. M. 2010. The trouble with JDM: Some limitations to the influence of JDM on organizational research. *Industrial and Organizational Psychology: Perspectives on Science and Practice*, 3: 411-416.

Stevens, S. S. 1936. A scale for the measurement of a psychological magnitude: Loudness. *Psychological Review*, 43: 405-416.

Stevens, S. S. 1961. To honor Fechner and repeal his law. *Science*, 133: 80-86.

Stevens, S. S. 1962. The surprising simplicity of sensory metrics. *American Psychologist*, 17: 29-39.

Tversky, A., & Kahneman, D. 1981. The framing of decisions and the psychology of choice. *Science*, 211: 453-458.

Tversky, A., & Kahneman, D. 1982. Judgments of and by representativeness. In D. Kahneman, P. Slovic, & A. Tversky (Eds.), *Judgment under uncertainty: Heuristics and biases:* 84-100. Cambridge, UK: Cambridge University Press.

Tversky, A., & Kahneman, D. 1991. Loss aversion in riskless choice: A reference-dependent model. *Quarterly Journal of Economics*, 106: 1039-1061.

Tversky, A., Sattath, S., & Slovic, P. 1988. Contingent weighting in judgment and choice. *Psychological Review*, 95: 371-384.

van den Bos, K. 2002. Assimilation and contrast in organizational justice: The role of primed mindsets in psychology of the fair process effect. *Organizational Behavior and Human Decision Processes*, 89: 866-880.

van den Bos, K., & van Prooijen, J.-W. 2001. Referent cognitions theory: The role of closeness of reference points in the psychology of voice. *Journal of Personality and Social Psychology*, 81: 616-626.

van den Bos, K., Vermunt, R., & Wilke, H. A. M. 1997. Procedural and distributive justice: What is fair depends more on what comes first than what comes next. *Journal of Personality and Social Psychology*, 72: 95-104.

Wade, J. B., O'Reilly, C. A., & Pollock, T. G. 2006. Overpaid CEOs and underpaid managers: Fairness and executive compensation. *Organization Science*, 17: 527-544.

Wang, X. M., Wong, K. F. E., & Kwong, J. Y. Y. 2010. The roles of rater goals and ratee performance levels in the distortion of performance ratings. *Journal of Applied Psychology*, 95: 546-561.

Weiss, H. M., & Rupp, D. E. 2011. Experiencing work: An essay on a person-centric work psychology. *Industrial and Organizational Psychology*, 4: 83-97.

Wong, K. F. E., & Kwong, J. Y. Y. 2005a. Between-individual comparisons in performance evaluation: A perspective from prospect theory. *Journal of Applied Psychology*, 90: 284-294.

Wong, K. F. E., & Kwong, J. Y. Y. 2005b. Comparing two tiny giants or two huge dwarfs? Preference reversals owing to number size framing. *Organizational Behavior and Human Decision Processes*, 98: 54-65.

Wong, K. F. E., & Kwong, J. Y. Y. 2007a. Effects of rater goal on rating patterns: Evidence from an experimental field study. *Journal of Applied Psychology*, 92: 577-585.

Wong, K. F. E., & Kwong, J. Y. Y. 2007b. The role of anticipated regret in escalation of commitment. *Journal of Applied Psychology*, 92: 545-554.

Yamagishi, K. 1997. When a 12.86% mortality is more dangerous than 24.14%: Implication for risk communication. *Applied Cognitive Psychology*, 11: 495-506.