The Effects of Public RPI and Public Goals on Performance

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ABSTRACT

Relative performance information (RPI) affects performance by inducing greater social comparisons, with these effects being stronger when RPI is public. Some studies find public RPI can increase performance, while others find public RPI may not be beneficial and even reduce performance. A common thread in the latter set of studies is the presence of other public information besides public RPI. We demonstrate the effects of public RPI also depend on employees' self-set performance goals being made public. Public RPI increases social comparison engagement, but less so when employees' self-set goals are public. Notably, public RPI lowers performance even when employees' self-set goals are private, as greater social comparison engagement leads employees to set lower goals, which in turn leads to lower performance. Collectively, our results highlight a potential downside to public RPI and reinforce the need for firms to consider what other information is made public in addition to RPI.

Keywords: performance; relative performance information; self-set goals; social comparison

Data Availability: Data are available from the authors upon request.

I. INTRODUCTION

Using an experiment, we examine the effects of public relative performance information (RPI) on performance in a setting in which employees set their own performance goals (hereafter, self-set goals), and also examine whether publicizing employees' self-set goals moderates the effects of public RPI in this setting. The use of RPI is widespread, including contexts in which RPI is not used for compensation or evaluation purposes (Anderson et al. 1983; Daly and Yatsenko 2023; Nordstrom et al. 1991; Schneider 2022; Tafkov 2013; Wikoff et al. 1983). Further, firms often provide detailed RPI whereby RPI includes information about employees' absolute performance levels in addition to their relative standing among employees (Hannan et al. 2019; Kramer et al. 2016; Zhang 2020).

When choosing to provide employees with RPI, an important decision firms face is whether to make RPI private (employees are aware only of their own relative standing of performance) or public (employees are aware of their own and their peers' relative standing of performance). Research finds RPI affects performance by motivating employees to engage more in social comparisons, and these effects are stronger when RPI is public than when RPI is private (Tafkov 2013). Notably, the effect of public RPI on performance via greater social comparison engagement appears to be nuanced; while some studies identify settings in which these effects are beneficial (Tafkov 2013), others identify conditions under which providing public RPI may not be beneficial (Hannan et al. 2013; Yatsenko 2022).

A common thread in the latter set of studies is the presence of other public information about employees besides public RPI. For example, Yatsenko (2022) finds public RPI does not lead to greater performance when information about the time employees spend performing the task is also made public. In fact, Yatsenko (2022) finds public RPI actually leads to lower

productivity (output per time spent) when information about the time employees spend performing the task is also made public.

We contribute to this line of research by demonstrating the effects of providing public RPI (relative to private RPI) depend on employees' self-set performance goals being made public. Lower-level employees often set their own performance goals (Chen et al. 2022; Feichter et al. 2018; Presslee et al. 2013), and firms often do not tie compensation and other explicit rewards to goal attainment, instead using employees' goals as an informal motivational tool (Clor-Proell et al. 2015; Gilbert 2021; Libby et al. 2019; Newman 2014). Importantly, many firms, including Google, Amazon, and LinkedIn, have adopted management practices such as Objectives and Key Results whereby employees set their own performance goals and these goals are made public, i.e., visible to others in the firm (Cenedella 2020; Fatemi 2016; Workpath 2022). Making these self-set goals public is argued to increase performance by not only encouraging employees to set more challenging goals in an effort to impress their peers, but also increasing their commitment to achieving those goals by creating a sense of accountability (Sull and Sull 2018). In other words, the effects of publicizing employees' self-set goals on performance operate through greater social comparison engagement. However, if publicizing employees' self-set goals motivates greater social comparison engagement, then there is less scope for public RPI to further heighten social comparison engagement. Thus, we predict an interaction such that public RPI increases social comparison engagement (relative to private RPI) when employees' self-set goals are private, but to a lesser degree when employees' self-set performance goals are also public.

We also contribute to the RPI literature by demonstrating public RPI (relative to private RPI) has a detrimental effect on performance even when employees' self-set performance goals

are private. As noted earlier, we expect public RPI to increase employees' social comparison engagement (relative to private RPI) when employees' self-set goals are private. In settings in which employees do not set performance goals (and in fact, no goals are set at all), prior RPI research finds greater social comparison engagement increases performance. In contrast, when employees set their own performance goals and these goals are private, we predict greater social comparison engagement decreases performance by motivating employees to set easier (more attainable) goals. People's self-esteem increases when they achieve their self-set goals but decreases when they fail to achieve their self-set goals (Bongers et al. 2009). When employees engage more in social comparisons, the potential for failing to achieve their goals and hurting their self-esteem looms larger. Thus, employees will set easier (more attainable) goals as doing so allows them to better protect their self-esteem. In turn, setting easier goals leads to lower performance; goal-setting theory argues easier or general "do your best" goals lead to lower performance than specific goals that are challenging, but obtainable (Locke and Latham 1990).

We test our predictions using an experiment in which participants complete a real-effort task adapted from Heyman and Ariely's (2004) study. In each round, participants receive a series of 3 × 3 grids containing nine numbers and must identify a pair of numbers in each grid that sums to 100. We form groups each consisting of five participants, and participants perform the task on their own for six rounds. In each round, participants earn piece-rate compensation for each correctly solved grid; participants do not receive any compensation for goal attainment. At the start of each round, each participant sets a goal for the round (number of grids they aim to solve), and participants receive feedback at the end about their individual performance (number of grids they actually solved). At the end of each round, participants receive RPI that compares and ranks each participant within the group based on performance in the most recently completed

round. We manipulate whether RPI is public by providing participants with information about only their own rank and performance (Private RPI condition) or the rank and performance of all participants in the group (Public RPI condition). We also manipulate whether goals are public by either not sharing each participant's self-set goals with the participant's group members (Private Goal condition) or sharing these goals with the participant's group members prior to participants performing the task for the round (Public Goal condition). We measure performance as the average number of correctly solved grids per round. We measure participants' social comparison engagement using questions adapted from Tafkov's (2013) study. Finally, we measure participants' goal level as the average goal level per round.

Consistent with our predictions, we find public RPI leads to greater social comparison engagement compared to private RPI when participants' self-set performance goals are private, but to a lesser degree when participants' goals are public. Also consistent with our predictions, we find participants' performance in the Private Goal condition is lower when RPI is public than when RPI is private. Consistent with our theory, we find this occurs because public RPI leads to greater social comparison engagement, which leads participants to set easier performance goals, and in turn, leads to lower performance.

Our study makes three main contributions. First, our results reinforce the need for firms to consider what other information is made public in addition to RPI. In a multi-task environment, Hannan et al. (2013) find the effects of public RPI on one task depend on the (public) RPI of another task. Yatsenko (2022) finds public RPI leads to lower productivity when information about employees' effort duration is also public, as employees fixate on RPI rank and ignore information about effort duration. In the same vein, we find making employees' self-set goals public attenuates the effects of public RPI. Interestingly, in our setting, our results suggest

the presence of a substitution effect in that public self-set goals appear to weaken and replace the effects of public RPI on employees' social comparison engagement. In that regard, our results also contribute to the literature on the interdependencies among different aspects of a firm's management control system (Grabner and Moers 2013).

Second, we identify a novel boundary condition for the motivational benefits of public RPI even when employees' self-set performance goals are private. Prior studies find public RPI increases performance via increased social comparison engagement in settings where employees do not set goals (Hannan et al. 2013, 2019; Tafkov 2013). But, we find this is not the case in settings where employees set their own goals, even if those goals remain private and are not shared with the employees' peers. In particular, we find public RPI increases employees' social comparison engagement, but this leads employees to set easier goals, which results in lower performance. To the best of our knowledge, our study is the first to examine the effects of public RPI in this novel setting, and our results highlight a potential downside to making RPI public in that setting.

Finally, we contribute to the literature on transparency more broadly. This literature examines the potential costs and benefits of making various types of information (e.g., internal reporting and pay level) public within firms (e.g., Chan and Zhang 2022; Evans et al. 2016; Guo et al. 2020). Related to our study, Chen et al. (2022) examine whether the effects of making employees' self-set goals public depend on whether employees earn tournament-based pay or piece-rate pay. The authors find publicizing employees' self-set goals leads to strategic lowballing behavior (intentionally setting easier goals) under a tournament compensation scheme but not under a piece-rate compensation scheme. Our study complements theirs by examining the moderating effects of publicizing employees' self-set goals in a setting in which employees work

under a piece-rate compensation scheme but also receive RPI that can motivate competitive behavior. Within that setting, we find public RPI leads to easier goals, which leads to lower performance, and publicizing employees' self-set goals attenuates the effects of public RPI. Also related to our study, Hartmann and Schreck (2017) examine the effects of public RPI and self-set performance targets on employees' task performance and their efforts to sabotage their peers. They find public RPI can motivate greater effort towards task performance and towards sabotaging their peers, and self-set performance targets can mitigate this effect. In their experiment, however, the RPI manipulation varies both whether RPI is provided and whether RPI is public, making it difficult to disentangle the effects of the presence of RPI versus the publicity of RPI. In addition, Hartmann and Schreck (2017) examine cumulative RPI grounded in performance across multiple periods, while we focus on "reset" RPI that is based on performance in the most recently completed period (Hannan et al. 2019). Our study also differs from Hartmann and Schreck's (2017) study in that employees' compensation in their study depends on whether employees achieve their self-set performance targets while self-set performance targets are not part of the compensation scheme in our study.

II. BACKGROUND AND HYPOTHESES

Background

RPI can motivate greater effort and performance even when compensation is not tied to RPI. Social comparison theory is a useful lens for understanding the effects of RPI on effort and performance (Tafkov 2013). According to social comparison theory, people have an inherent desire to evaluate their abilities and compare their abilities to those of others (Festinger 1954). Since abilities cannot be observed directly, people evaluate their abilities by comparing their performance to that of others; performing better than others implies superior ability and enhances self-esteem, while performing worse than others implies inferior ability and threatens self-

esteem. Since people seek to enhance or protect their self-esteem (Festinger 1954; Gibbons et al. 1994; Hoffman et al. 1954; Major et al. 1991), individuals exert greater effort in an attempt to outperform others when opportunities for social comparison arise.

Some studies find public RPI leads to greater effort and performance than private RPI. For example, Tafkov (2013) finds public RPI magnifies the social comparison process compared to private RPI, resulting in greater effort and performance with public RPI. However, other studies find public RPI may not be beneficial. For example, when employees perform multiple tasks and receive RPI on each individual task, Hannan et al. (2013) find RPI has an effort distortion effect that is detrimental to performance. Specifically, when employees have discretion over how to allocate their effort across multiple tasks, they tend to allocate more effort to tasks for which they receive favorable RPI. Notably, Hannan et al. (2013) find allocating effort in this manner leads to lower total performance across all tasks. In addition, Yatsenko (2022) finds public RPI does not increase performance – and actually lowers productivity (output per time spent) – when employees can monitor the time that peers spend working on the task (i.e., their effort duration).

A notable aspect of the latter two studies just discussed is that they examine the effects of public RPI in settings in which additional information about employees is also publicly available. Specifically, in Hannan et al.'s (2013) study, the effects of public RPI on one task are examined in the context of public RPI on another task. Likewise, in Yatsenko's (2022) study, the effects of public RPI are examined in the context of public information about employees' effort duration.

We contribute to this line of research by demonstrating the effects of providing public RPI (relative to private RPI) also depend on employees' self-set performance goals being made public. Research indicates employees often set their own goals (Chen et al. 2022; Feichter et al.

2018; Presslee et al. 2013). This likely occurs because self-set goals can be more beneficial than assigned goals, not only in terms of benefits such as greater performance, but also in terms of other benefits such as greater organizational citizenship behavior (Welsh et al. 2020). In addition, while firms can tie explicit incentives to goal attainment (e.g., bonuses, promotions, etc.), they often use goals as motivational tools even without tying explicit incentives to goal attainment (Clor-Proell et al. 2015; Gilbert 2021; Libby et al. 2019; Newman 2014). Importantly, publicizing employees' self-set goals has become more commonplace (Sull and Sull 2018). For example, management tools such as Objectives and Key Results have become popular in leading multinational firms such as Google, Amazon, and LinkedIn (Cenedella 2020; Fatemi 2016; Workpath 2022). A key element of this organizational practice is making employees' self-set goals public.

The results of a survey we conducted confirm the widespread use of both private and public self-set goals. We recruit 100 survey respondents from Amazon's Mechanical Turk.[1] Respondents receive $0.50 for completing the survey, and completing the survey takes approximately five minutes. On average, the respondents are 40.51 years old and have eight years of work experience. Forty-nine percent identify as female. Respondents work in 16 different types of industries (e.g., finance and insurance, educational services, health care, and social assistance), and employer size ranges from less than 1,000 employees to over 10,000 employees. We ask respondents whether their employers require them to set goals and whether those goals are publicized. Ninety-three percent of respondents indicate they set their own performance goals, and 56 percent indicate their employers require them to set performance goals. Fifty-five percent of respondents who set their own performance goals indicate their goals

[1] We obtained IRB approval for both the survey reported here and the experiment reported in Section III.

are shared with others within the firm. Collectively, these results suggest meaningful variation in the extent to which employees set their own goals and whether those goals are public.[2]

Notably, publicizing employees' self-set goals public is argued to increase performance by not only encouraging employees to set more challenging goals in an effort to impress their peers, but also increasing their commitment to achieving those goals by creating a sense of accountability (Sull and Sull 2018). In other words, the effects of publicizing employees' self-set goals on performance operate through greater social comparison engagement. However, if publicizing employees' self-set goals motivates greater social comparison engagement, then it is unclear whether publicizing RPI will have an incremental effect on performance, over and above the effects of publicizing employees' self-set goals. Thus, we seek to better understand this issue by examining the interactive effects of making RPI public and making employees' self-set goals public on performance.

Hypotheses

We develop a causal model to capture the effects of publicizing RPI and publicizing self-set goals on performance (see Figure 1). To start, we develop three hypotheses that outline the interactive effects of public RPI and public self-set goals on employees' social comparison engagement (H1a-H1c). These hypotheses correspond to Links 1-3 in the causal model. Then, we develop two hypotheses on the effects of social comparison engagement on employees' self-set (H2a) and in turn, on employees' performance (H2b). These correspond to Links 4 and 5 in the causal model.

[2] We designed our survey to better understand the extent to which employees set their own performance goals, and for those who do set their own performance goals, the extent to which their goals are made public. Thus, the survey does not include questions about the extent to which goal attainment is made public. As Chen et al. (2022) note, however, firms that publicize their employees' goals often do not publicize employees' goal attainment. Instead, managers often meet with their employees in private to discuss their employees' goal attainment (or lack thereof) and ways to improve future performance.

H1a-H1c: Interactive Effects of RPI Publicity and Self-Set Goal Publicity on Employees' Social Comparison Engagement

In Link 1, we seek to replicate one of Tafkov's (2013) key results and predict publicizing RPI leads to greater social comparison engagement.[3] As discussed earlier, social comparison theory asserts people have an inherent desire to compare their abilities to those of their peers (Festinger 1954); comparing favorably generates positive feelings such as pride, while comparing unfavorably generates negative feelings such as shame (Smith 2000). Public RPI provides employees with not only their own performance information (as with private RPI), but also that of other employees, enabling peers (other employees) to make better inferences about employees' performance, and vice versa (Tafkov 2013). As a result, public RPI magnifies the positive and negative feelings that arise from engaging in social comparisons. Since employees seek to experience positive feelings and avoid negative feelings, public RPI more strongly motivates employees to engage in social comparisons than private RPI.

H1a: When employees set private performance goals, employees' social comparison engagement is greater with public RPI than with private RPI.

In Link 2, we predict making employees' self-set goals public leads to greater social comparison engagement. Employees can use private self-set goals as commitment devices with the aim of improving their own performance. When self-set goals are private, social comparisons via goals are not possible, so we expect limited social comparison engagement. In contrast, Chen et al. (2022) argue making goals public can raise social concerns because employees view others' public self-set goals as relevant information for drawing inferences about expected

[3] Our replication is a form of "differentiated replication (or in-principle replication)" (Salterio 2014). Unlike "close replication," which keeps most of the conditions the same, differentiated replication involves variations in major aspects of the conditions of the original study (Salterio 2014). Compared to Tafkov's (2013) study, the major variation in our study involves examining the effects of public RPI in a setting in which employees set goals, whereas employee goals are not part of the setting Tafkov (2013) examines in his study.

relative performance, and thus, about employees' relative abilities. Building on this line of reasoning, we expect employees in our setting to use their and others' public self-set goals to draw inferences about their relative abilities. Thus, public self-set goals will lead to greater social comparison engagement than private goals, especially in a setting in which employees' performance information is not public.

> **H1b:** When RPI is private, employees' social comparison engagement is greater when employees' self-set goals are public than when those goals are private.

In Link 3, we predict making self-set goals public will weaken the effects of public RPI on employees' social comparison engagement. As discussed in the development of H1b, making employees' self-set goals public will heighten employees' social comparison engagement. Consequently, since employees' self-set goals are made public before employees receive RPI, there is less scope for public RPI to further increase employees' social comparison engagement when employees' self-set goals are public. In other words, once employees already have heightened social comparison engagement by focusing on public self-set goals, then there would be less room for public RPI to further heighten social comparison engagement.

> **H1c:** When employees' self-set goals are public, public RPI has less of an effect on employees' social comparison engagement than when employees' self-set goals are private.

H2a/H2b: Effects of Social Comparison Engagement on Performance via Self-Set Goal Levels

We now turn to Links 4 and 5, which capture the effects of social comparison engagement on performance via employees' self-set goal levels. In Link 4, we predict greater social comparison engagement leads employees to set easier goals. As employees engage more in social comparisons, they perceive a greater threat to their self-esteem, such as the anticipation of failing to achieve their goals. In response to such threats, people engage in more self-enhancing strategies (Baumeister 1993; Baumeister and Jones 1978; Brockner 1988; Crocker et

al. 1993). In our setting, setting easier self-set goals and achieving them can be one such strategy (Brown and Dutton 1995; Crocker et al. 2002; Greenberg and Pyszczynski 1985; Heatherton and Polivy 1991).

Greater social comparison engagement may also lead to easier self-set goals due to impression management. Employees who attain their goals often receive "favorable" status in the eyes of their peers, and setting easier self-set goals helps increase the likelihood of goal attainment (Bozeman and Kacmar 1997). Consistent with this intuition, Webb et al. (2010) examine factors that influence the difficulty of employees' self-set goals and find stronger intentions to engage in impression management behavior are associated with easier self-set goals.

H2a: Greater social comparison engagement leads to easier self-set goals.

In Link 5, we predict setting easier goals leads to lower performance. Research finds self-set goals have motivational benefits that can result in greater performance (Klein et al. 2013; Locke and Latham 1990; Locke et al. 1981). In addition, goal-setting theory argues easy and easy and general "do your best goals" lead to lower performance than specific goals that are challenging, but obtainable.

H2b: Easier self-set goals lead to lower performance.

Before discussing our experimental design and results, we note that we do not develop a hypothesis regarding the direct effects of goal publicity on goal levels because we are not aware of any theory or evidence that suggests goal publicity would affect goal levels through a mechanism that is separate from social comparison engagement. In our supplemental analyses, however, we test whether such a direct effect exists in our data.

III. Research Design

Participants

We recruit 160 undergraduate students from a participant pool maintained by the behavioral research lab at a public university in the Midwestern United States. We recruit students of all majors because our task requires only basic arithmetic and does not require any specialized knowledge. On average, participants are 20 years old and have junior class standing. The average GPA is 3.64, and participants collectively indicate studying 102 unique majors. Twenty-eight percent of participants identify as male. GPA and gender are correlated with performance, but the direction and statistical significance of our results remain the same even when we control for these demographic variables in the analyses. Thus, we do not include these variables in the analyses we report in Section Four.

Task

We adapt Heyman and Ariely's (2004) task in which participants receive a series of grids and must identify a pair of numbers in each grid that sums to 100. Each grid consists of nine numbers arranged in a 3 × 3 grid. We randomly generate the grids ahead of time, and all participants view the same grids presented in the same order. Participants perform the task on the computer for six rounds, with each round lasting three minutes. During each round, the computer screen reports participants' performance in the round in real time and indicates the time remaining in the round. Participants work through grids sequentially and must correctly solve a grid before advancing to the next one (each grid has a unique solution). We include 50 grids in each round, as pilot testing indicates this number of grids ensures participants will not run out of grids to solve in each round. Each experimental session comprises five participants, and these participants constitute a single group. These group assignments help facilitate our RPI manipulation. Although participants are in groups, they perform the task on their own. After each

round, participants receive individual performance feedback (number of grids correctly solved) for the most recently completed round.

Our experimental task satisfies the three conditions for social comparisons to arise: (1) task similarity, (2) comparison target similarity, and (3) task domain importance. Our task satisfies the first condition because all participants complete the same task and experience the task in the same manner (the sequence of grids in each round is identical for all participants). Our task satisfies the second condition because we limit participation to undergraduate students aged 18 years or older who attend the same university. Our task satisfies the third condition because differences in task performance reflect differences in general problem-solving ability, and general problem-solving ability is important to participants. We confirm participants relate task performance to general problem-solving ability by asking them to rate their agreement with the following statement: "Do you agree that solving the grids requires not only mechanical skill, but also general problem-solving ability?" Participants respond using a 7-point scale with endpoints of 1 = Complete Disagree and 7 = Completely Agree. The mean rating is 5.79 and is above the midpoint of 4.00 ($p < 0.01$), indicating participants associate task performance with general problem-solving ability.[4] We also confirm the importance of general problem-solving ability by asking participants to rate the degree to which general problem-solving ability is important to them personally, important for success in life, and important for success in business. Participants respond to each item using a 7-point scale with endpoints of 1 = Extremely Unimportant and 7 = Extremely Important. The mean ratings are 6.28 for importance to the participant, 6.44 for importance for success in life, and 6.31 for importance for success in business; each is above the midpoint of 4.00 ($p < 0.01$).

[4] Throughout the paper, we report two-tailed p-values, unless otherwise noted.

Manipulations

We manipulate both RPI publicity and goal publicity between subjects (see Appendix A for screenshots). We manipulate RPI publicity at two levels. In the Private RPI condition, participants receive performance and rank information for only their own performance at the end of each round.[5] The rank information indicates how each participant's performance in the most recently completed round compares to that of the other four participants in the group; a rank of 1 indicates performing better than all of the other participants in the group, while a rank of 5 indicates performing worse than all of the other participants in the group. In the Public RPI condition, participants receive performance and rank information for both themselves and the other four participants in their group.

We manipulate goal publicity at two levels.[6] In the Private Goal condition, the goals participants set are known only to themselves. In the Public Goal condition, participants' goals are visible to the other four group members; these goals are publicized at the start of each round. Publicizing goals at the start of each round mirrors how self-set goals are publicized in practice, i.e., goals are publicized when set.[7]

[5] As noted earlier, firms often provide detailed RPI whereby RPI includes information about employees' absolute performance levels in addition to their relative standing among employees (Hannan et al. 2019; Kramer et al. 2016; Zhang 2020)

[6] We also recruit 80 participants for a No Goals condition in which participants do not set any goals. Within this condition, 40 participants receive private RPI while the other 40 participants receive public RPI. However, when asked in the post-experimental questionnaire about whether they set performance goals and if so, whether those goals were visible to others in the session, 50 out of 80 participants fail this manipulation check question. In the Private RPI/No Goals cell, 24 out of 40 participants indicate they set private goals. In the Public RPI/No Goals cell, 21 out of 40 participants indicate they set private goals and 5 out of 40 participants indicate they set public goals. In untabulated analyses, we find the responses and behaviors of these participants are similar to their counterparts in the Private Goal and Public Goal conditions. Collectively, this suggests many participants in the No Goals condition set goals for themselves on their own. Thus, we do not include the No Goals condition in our analyses.

[7] We do not provide goal attainment information with Public RPI to separate the effect of publicizing RPI from the confounding effect of progress towards goal attainment. And, as noted earlier, we do not provide any public information about performance in the Public Goal condition to separate the effect of publicizing goals from the confounding effect of RPI.

Setting and Procedure

Each experimental session consists of five participants and one administrator. We conduct the sessions in March and April 2021 on Zoom due to COVID-19. To minimize the potential for differences in participants' devices affecting our results, we ask participants to use only a desktop or a laptop to complete the experiment. To ensure participants' compliance with this device requirement, the study administrator checked the type of device participants use through their webcams. If a participant tried to use a different device (e.g., cell phone), the administrator asked the participant to switch to a computer; otherwise, the session was canceled. After giving their consent to participate in the study, participants receive an initial set of instructions that ask them to keep their webcam on during the study and to refrain from talking to other participants except in one instance described shortly. The instructions also indicate the use of any external aids such as calculators, pens, and paper is prohibited, and the study administrator monitors compliance throughout the session via webcam. Then, participants receive details about the task and familiarize themselves with the mechanics of the task via a practice round lasting three minutes.[8]

At the end of the practice round, participants receive feedback indicating the number of grids they solved correctly in the practice round. After the practice round, participants learn they will perform the task for six main rounds, each lasting 3 minutes, with a 10-second break between rounds. Participants also learn they will receive $5 for completing the study and earn an additional $0.11 for each correctly solved grid in the six main rounds.[9] The piece-rate payment

[8] The five links in our causal model have the hypothesized sign and are statistically significant (all p-values < 0.03), even after including practice round performance as a control variable. We also find practice round performance is positively related to our main dependent measure, *Average Performance* (coefficient = 0.42, p < 0.01).
[9] Based on pilot tests of different piece-rate amounts, setting the piece-rate at $0.11 per correctly solved grid allows us to motivate participants to work on the task and adhere to the behavioral research lab's policy regarding participant payments.

scheme ensures participants in all conditions have the same economic incentive to perform their best, which allows us to draw stronger inferences about the extent to which differences in social comparisons drive differences in performance across conditions. Participants also receive information related to their assigned RPI and goal treatment conditions. Then, they take a comprehension quiz that tests their understanding of the information provided in the instructions, and they must answer all the questions correctly to proceed to the next phase of the experiment.

Once all participants in the session successfully complete the quiz, participants introduce themselves as "Participant 1," "Participant 2," etc., using their microphones while their webcam is on. This procedure ensures participants associate each participant number with a real person in the session, and the participant numbers facilitate our RPI and goal manipulations. After these introductions, participants perform the task for six rounds. After the last round, participants complete a post-experimental questionnaire designed to capture process measures and demographic information. Then, they learn their final payout for participating in the study. On average, participants earn $17.10, and they receive their compensation in the form of an Amazon gift card within four weeks of participation.

IV. RESULTS

Comprehension Checks

We ask two comprehension check questions immediately after the main task: (1) "Could the other participants in the session see your goals in each round?" and (2) "Could the other participants in the session see your performance rank in each round?" Only five out of 160 participants answer one or both of these comprehension check questions incorrectly.[10] Since our

[10] All five participants were in the Private RPI/Public Goal cell. One participant answered both comprehension check questions incorrectly, and four participants answered the comprehension check question on RPI publicity incorrectly.

inferences do not change after dropping these five participants from the analyses (one-tailed $p \leq 0.07$ for all of our hypothesis tests), we retain all 160 participants in our analyses.

Main Test Variables

Before reporting the results, we define the key variables in our analyses. We report descriptive statistics in Table 1. The main independent variables are *Public RPI*, which is an indicator variable equal to 1 for the Public RPI condition and 0 for the Private RPI condition, and *Public Goal*, which is an indicator variable equal to 1 for the Public Goal condition and 0 for the Private Goal condition.

Social Comparison Engagement is the average response to three post-experiment questions adapted from Tafkov's (2013) study. First, using a 7-point response scale with endpoints of 1 = Not at all and 7 = To a great extent, participants respond to the following question: "To what extent were you nervous or concerned about how your performance compares to that of the other participants in the session?" Second, using a 7-point response scale with endpoints of 1 = Never and 7 = Often, participants respond to the following question: "How often was your ability to concentrate on the problems disrupted by thinking about how your performance compares to that of the other participants in the session?" Third, using a 7-point response scale with endpoints of 1 = Never and 7 = Often, participants respond to the following question: "How often was your ability to concentrate on solving the tasks disrupted by thinking about how your goal compares to that of the other participants in the session?" We report descriptive statistics for participants' responses to these items in Appendix B. The Cronbach's alpha for these three questions is 0.78.[11]

[11] Using a 7-point scale response scale with endpoints of 1 = Never and 7 = Often, participants also respond to the following post-experiment question: "How often did you want to know how your performance compares to that of the other participants in the session?" A factor analysis of this and the other three questions reveal a single factor

Average Performance is the average number of grids correctly solved across the six rounds. Finally, *Average Goal Level* is the average goal participants set at the start of each round regarding the number of grids they aim to solve in the round.

Hypothesis Tests

Collectively, the first set of hypotheses (H1a-H1c) predicts both RPI publicity and goal publicity increase social comparison engagement (H1a and H1b, respectively), and RPI publicity increases social comparison engagement to a lesser extent when goals are public (H1c). The second set of hypotheses (H2a and H2b) predict social comparison engagement affects self-set goal levels (H2a), which in turn affects performance (H2b). We test the hypotheses by analyzing the causal model shown in Figure 1 and report the results in Figure 2. When analyzing the causal model, we cluster the data by group to account for variation that may arise at the group level. The model fits the data well, as the Standardized Root Mean Square Residual (SRMR) = 0.07.[12]

The results are consistent with H1a-H1c. Given the coding of our variables, H1a predicts a positive coefficient for the link between *Public RPI* and *Social Comparison Engagement* (Link 1), H1b predicts a positive coefficient for the link between *Public Goal* and *Social Comparison Engagement* (Link 2), and H1c predicts a negative coefficient for the interaction between *Public RPI* and *Public Goal* on *Social Comparison Engagement* (Link 3). Consistent with H1a, the coefficient for Link 1 is positive and statistically significant (one-tailed $p = 0.04$), which indicates public RPI heightens social comparison engagement. Consistent with H1b, the

with an eigenvalue greater than one. However, the question "How often did you want to know how your performance compares to that of the other participants in the session?" has a low factor loading of 0.24. Further, the Cronbach's alpha for the four questions is only 0.69. Thus, we construct *Social Comparison Engagement* using responses to the three questions described in the main text. If we construct *Social Comparison Engagement* using the average response to all four questions, we continue to find support for all hypotheses (all p-values ≤ 0.08).

[12] The SRMR is below the conventional cutoff of 0.08 (Hu and Bentler 1999). The need to cluster by group precludes the ability to calculate other model fit indices.

coefficient for Link 2 is positive and statistically significant (one-tailed $p = 0.05$), which indicates public goals increase social comparison engagement. Consistent with H1c, the coefficient for Link 3 is negative and statistically significant (one-tailed $p = 0.07$), which indicates public goals attenuate the effects of public RPI on social comparison engagement.

The magnitudes of the coefficients for Links 2 and 3 suggest the presence of a substitution effect in that public self-set goals appear to weaken and replace the effects of public RPI on employees' social comparison engagement. Specifically, the coefficient on Link 3 (the interaction term) is -0.49, which offsets the coefficient of +0.33 on Link 1 (the effect of *Public RPI* on *Social Comparison Engagement*), and the coefficient on Link 2 (the effect of *Public Goal* on *Social Comparison Engagement*) is +0.48. Thus, these results highlight the potential existence of interdependencies among two different aspects of a firm's management control system (Grabner and Moers 2013).

The results are also consistent with H2a-H2b. Given the coding of our variables, H2a predicts a negative coefficient for the link between *Social Comparison Engagement* and *Average Goal Level* (Link 4), and H2b predicts a positive coefficient for the link between *Average Goal Level* and *Average Performance Level* (Link 5). Consistent with H2a, the coefficient for Link 4 is negative and statistically significant ($p < 0.01$), which indicates greater social comparison engagement leads to easier self-set goals. Finally, consistent with H2b, the coefficient for Link 5 is positive and statistically significant ($p < 0.01$), which indicates easier self-set goals lead to lower performance.

Supplemental Analyses

Alternative Test of H1a-H1c Using Multi-Group Path Analysis

As an additional test of H1a-H1c, we conduct multi-group path analysis, which entails estimating the following causal model separately for the Private Goal and Public Goal conditions: *Public RPI → Social Comparison Engagement → Average Goal Level → Average Performance*. For this analysis, *Social Comparison Engagement* is the average response to the two post-experiment questions capturing participants' focus on RPI (see earlier discussion in the Main Test Variables subsection and Appendix B), as this more cleanly captures how (public) RPI directs participants' attention on how their performance compares to that of their peers (Tafkov 2013). All other measures are the same as the main hypothesis tests.

In Figure 3, we present the results for the Private Goal condition in Panel A and the Public Goal condition in Panel B. Given our theory for H1a-H1c, we are particularly interested in potential differences in the *Public RPI → Social Comparison Engagement* link between the Private Goal and Public Goal conditions. Specifically, our theory predicts the *Public RPI → Social Comparison Engagement* link will be weaker (less positive) in the Public Goal condition than in the Private Goal condition.

The results in Figure 3 are consistent with our theory for H1a-H1c. As shown in Panel A, the coefficient on the *Public RPI → Social Comparison Engagement* link is positive and statistically significant in the Private Goal condition ($p < 0.01$). As shown in Panel B, however, the coefficient on the *Public RPI → Social Comparison Engagement* link is not statistically significant in the Public Goal condition ($p = 0.49$). A chi-square difference test comparing these two coefficients indicates they are different from each other ($\chi^2 = 4.28$, $p = 0.04$, not tabulated).

Thus, consistent with H1a-H1c, we find the effects of public RPI on social comparison engagement are weaker when participants' self-set goals are public rather than private.

Ex-Post Model Fit Improvement

Our hypotheses reflect our ex-ante expectations regarding the links among the variables in our causal model. Although the model fits the data well, sensitivity analyses indicate model fit improves after adding a direct link between *Social Comparison Engagement* and *Average Performance*.[13] Thus, we add this link to the model and repeat our hypothesis tests. The model fit remains similar, as the SRMR equals 0.065 (vs. 0.07 for the original model).

As shown in Figure 4, we continue to find support for all hypotheses; the coefficients for Links 1-5 have the theorized sign and are statistically significant. In addition, the coefficient on the newly added link between *Social Comparison Engagement* and *Average Performance* is negative and statistically significant ($p < 0.01$). This result, when combined with our results for H2a and H2b (Links 4 and 5), suggests *Average Goal Level* partially mediates the effect of *Social Comparison Engagement* on *Average Performance*.

While our theory for H2a focuses on the effects of social comparison engagement on the difficulty of the goals participants set for themselves, we also consider how the difficulty of the goals participants set for themselves changes over time. Specifically, we estimate a regression with the goal level participants set in a round as the dependent variable (*Goal Level*), and the

[13] Specifically, we calculate modification indices, which measure the change in the model's goodness of fit from adding or deleting links among the variables in the model. The modification indices reveal model fit would improve by adding a direct link between *Social Comparison Engagement* and *Average Performance*. Interestingly, the modification indices indicate model fit would not improve by adding direct links from *Public RPI*, *Public Goal*, and the interaction between *Public RPI* and *Public Goal* to *Average Performance*. Consistent with this, when adding these links to our model, we find the coefficients for these three links are not statistically significant (all p-values > 0.30, untabulated), which suggests the effects of *Public RPI* and *Public Goal* on *Average Performance* are fully mediated by *Social Comparison Engagement* and *Average Goal Level*. In addition, the modification indices also indicate model fit would not improve by adding a direct link from *Public Goal* to *Average Goal Level*. Consistent with this, when adding this link to our model, we find the coefficient for this link is not statistically significant ($p = 0.80$)

following independent variables: *Public RPI*; *Public Goals*; the interaction between *Public RPI* and *Public Goals*; participants' performance in the prior round (*Prior Round Performance*); participants' goal level in the prior round (*Prior Round Goal Level*); participants' rank in the prior round (*Prior Round Rank*); and whether participants attained the goal in the prior round (*Prior Round Goal Attainment*).

As shown in Table 2, we find the coefficients on *Prior Round Performance* and *Prior Round Goal Level* are positive and statistically significant (both $p < 0.01$). Interestingly, the coefficients on *Prior Round Rank* and *Prior Round Goal Attainment* are not statistically significant (both p-values ≥ 0.75). Importantly, the pattern of coefficients for *Public RPI*, *Public Goal*, and their interaction are consistent with our theory; the effects of *Public RPI* on participants' goals are reduced when those goals are public rather than private (interaction p-value = 0.06).

Goal Commitment

Implicit in the theory underlying H2b is the notion that employees are sufficiently committed to attaining their self-set goals. Indeed, research finds goal commitment moderates the relationship between goal difficulty and performance, such that the relationship between goal difficulty and performance is stronger (more positive) as goal commitment increases (Locke and Latham 2002).

We assess participants' goal commitment using their responses to the following question: "How committed are you to achieving your goal for this round?" Participants respond using a 7-point response scale with endpoints of 1 = Not committed at all and 7 = Extremely committed. Participants respond to this question at the start of each round immediately after setting their goal for the round.

We analyze participants' responses in two ways (both untabulated). First, we conduct a t-test to assess whether participants' responses exceed the response scale midpoint of 4. We find the mean response (5.82) exceeds the midpoint of 4 ($t = 48.70$, two-tailed- $p < 0.01$). Thus, participants appear to be sufficiently committed to attaining their self-set goals. Second, we estimate a regression with participants' responses in each round as the dependent variable, and *Public RPI*, *Public Goal*, and their interaction as the independent variables. We cluster the data by participant to account for participants indicating their goal commitment in each of the six rounds. We find the coefficients on all three independent variables are not statistically significant (two-tailed $p \geq 0.60$). Thus, we do not find goal commitment systematically varies by condition.

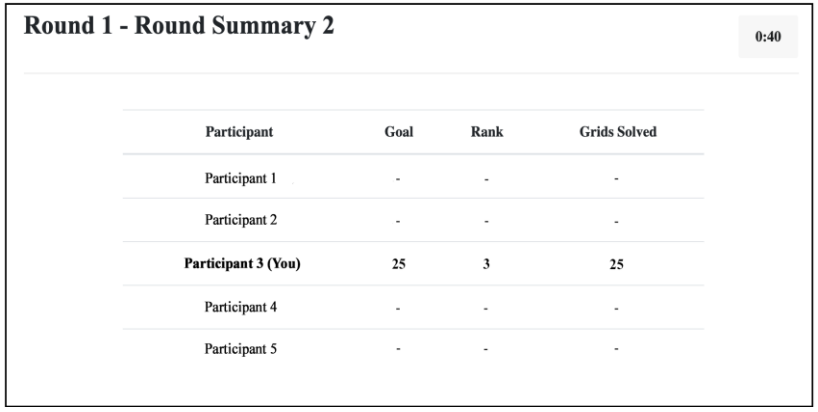
V. CONCLUSION

Research finds RPI increases performance by inducing social comparisons, with these effects being stronger when RPI is public (Tafkov 2013). However, recent studies suggest public RPI may not be beneficial (Hannan et al. 2013; Yatsenko 2022), and a common thread in these latter studies is the presence of other public information about employees. We contribute to this line of inquiry by showing public RPI leads to lower performance in a setting in which employees set their own performance goals and compensation and other extrinsic rewards are not tied to goal attainment. In this setting, public RPI increases social comparison engagement, but greater social comparison engagement leads employees to set easier goals, which in turn leads to lower performance. We also find publicizing employees' self-set goals attenuates the effects of public RPI on social comparison engagement. Collectively, not only do our results point to self-set goals as a boundary condition regarding the benefits of public RPI, but they also reinforce the need for firms to consider what other information they make public in addition to RPI.

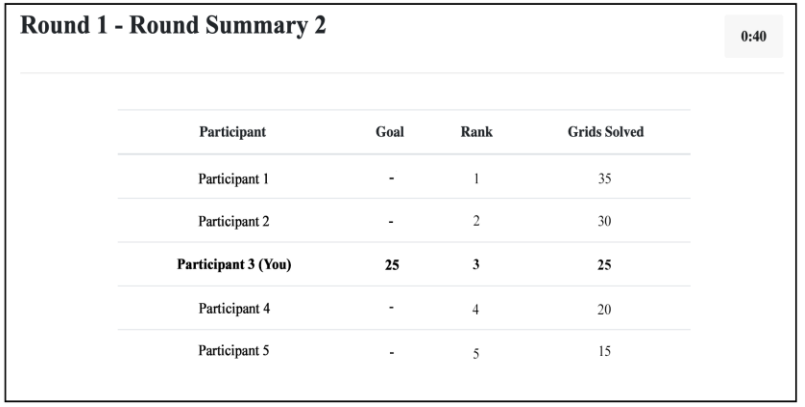
Future research can build on our study in several ways. First, while we examine the interactive effects of RPI publicity and self-set goal publicity in a setting in which employees perform a single task, future research can extend our analysis to multi-task settings (Hannan et al. 2013, 2019). Second, while we operationalize RPI as "reset" RPI in that RPI pertains only to performance in the most recently completed round and "resets" after each round, future research can extend our analysis to scenarios involving "cumulative" RPI that pertains to performance in all completed rounds to date (Hannan et al. 2019), or even scenarios in which employees receive both reset and cumulative RPI (Choi et al. 2016).

APPENDIX A. Round summary screen by cell

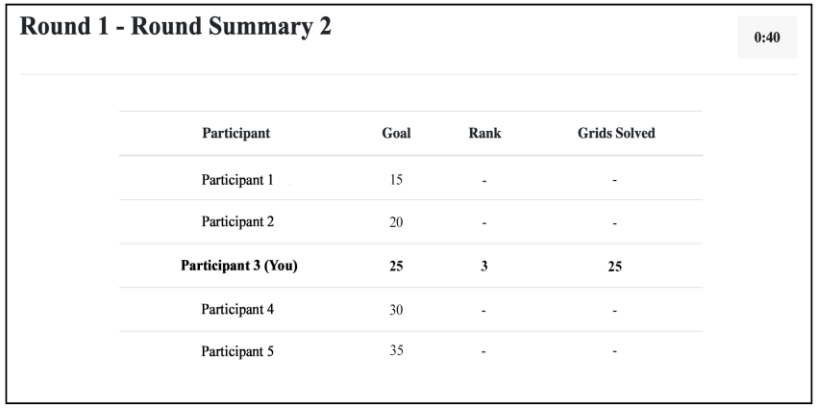
(Private RPI, Private Goal Cell)



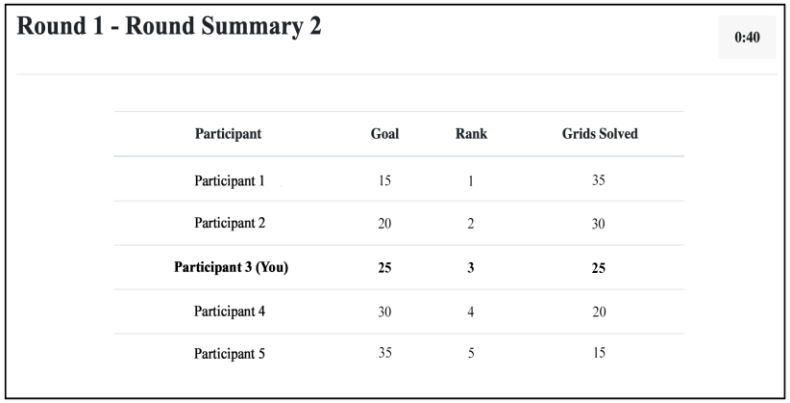
(Public RPI, Private Goal Cell)



(Private RPI, Public Goal Cell)



(Public RPI, Public Goal Cell)



Appendix B. Descriptive Statistics for Items Used to Construct *Social Comparison Engagement* and Factor Loadings

Panel A: Descriptive Statistics – Mean (Standard Deviation)

	Private Goals Condition		**Public Goals Condition**	
Question	**Private RPI (N = 40)**	**Public RPI (N = 40)**	**Private RPI (N = 40)**	**Public RPI (N = 40)**
Question 1	4.93 (1.67)	4.93 (1.65)	5.33 (1.64)	4.60 (1.68)
Question 2	3.80 (1.54)	4.05 (1.72)	4.45 (1.68)	4.03 (1.90)
Question 3	3.25 (1.43)	4.03 (1.56)	3.75 (1.82)	3.78 (1.87)
Question 4	2.80 (1.49)	2.78 (1.59)	3.10 (1.57)	3.03 (1.78)

Panel B: Factor Loadings Using All Four Items

Question	**Factor Loading**
Question 1	0.24
Question 2	0.69
Question 3	0.79
Question 4	0.64

Cronbach's Alpha = 0.69

Panel C: Factor Loadings After Excluding Question 1

Question	**Factor Loading**
Question 2	0.68
Question 3	0.79
Question 4	0.65

Cronbach's Alpha = 0.78

Appendix B (Continued)

Question 1: How often did you want to know how your performance compares to that of the other participants in the session? (7-point response scale with endpoints of 1 = Never and 7 = Often).

Question 2: To what extent were you nervous or concerned about how your performance compares to that of the other participants in the session? (7-point response scale with endpoints of 1 = Not at all and 7 = To a great extent).

Question 3: How often was your ability to concentrate on the problems disrupted by thinking about how your performance compares to that of the other participants in the session? (7-point response scale with endpoints of 1 = Never and 7 = Often).

Question 4: How often was your ability to concentrate on solving the tasks disrupted by thinking about how your goal compares to that of the other participants in the session? (7-point response scale with endpoints of 1 = Never and 7 = Often).

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FIGURE 1
Causal Model of the Interactive Effects of Publicizing RPI and Publicizing Self-Set Goals on Performance via Social Comparison Engagement and Self-Set Goal Level

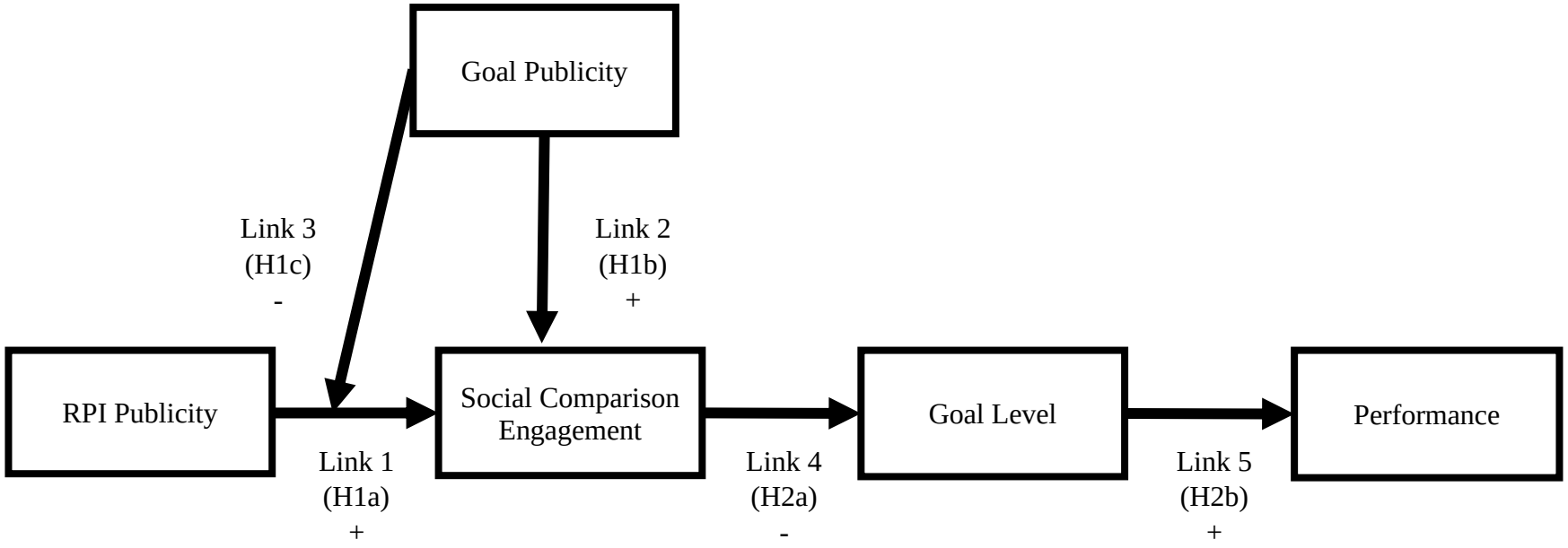
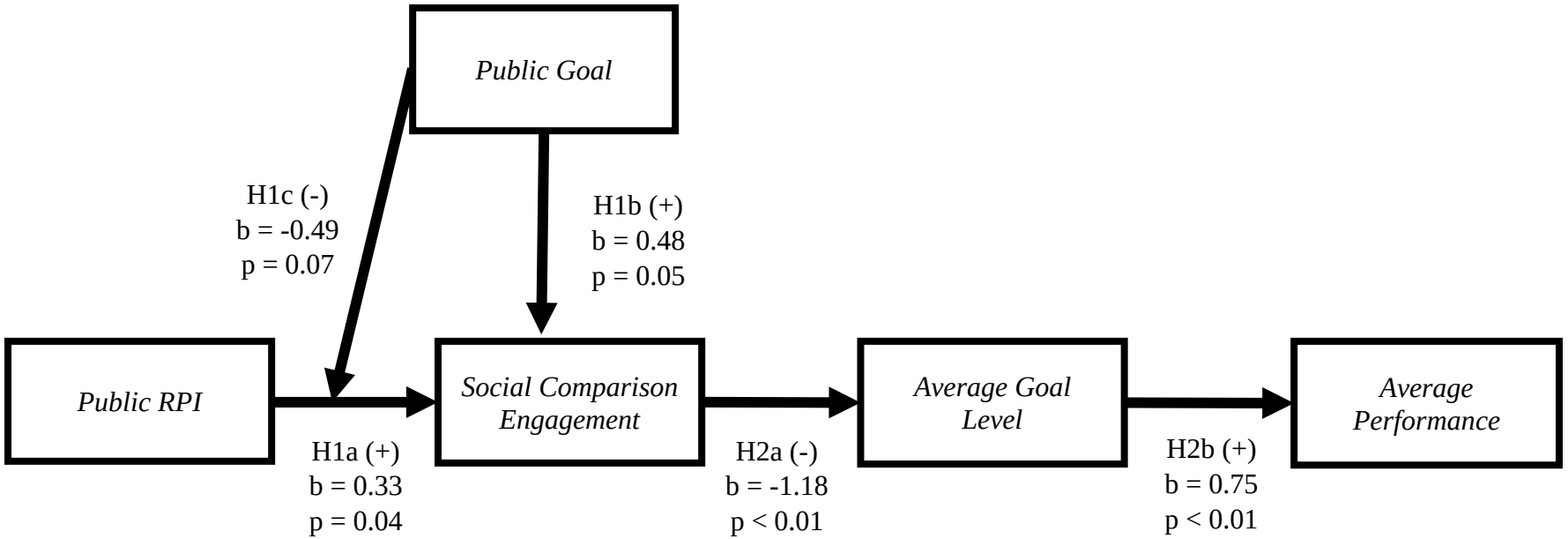


FIGURE 2
Hypothesis Tests



We report one-tailed p-values because the hypotheses involve directional predictions, and we report predicted signs in parentheses. We cluster standard errors by session.

SRMR = 0.07. No other fit indices are available due to clustering.

N = 160.

Figure 2 (Continued)

Public RPI is an indicator variable equal to 1 for the Public RPI condition and 0 for the Private RPI condition.

Public Goal is an indicator variable equal to 1 for the Public Goal condition and 0 for the Private Goal condition.

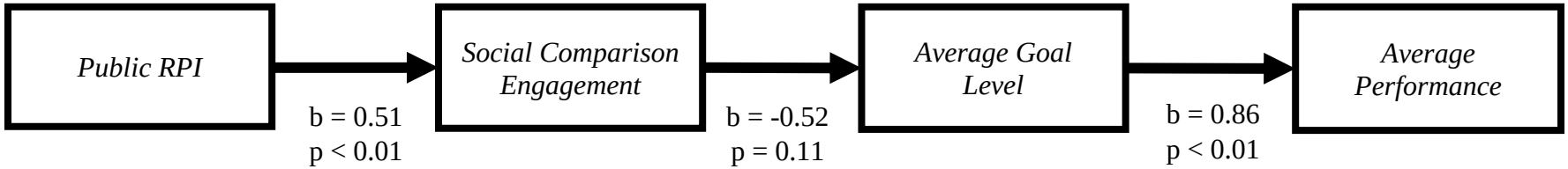
Social Comparison Engagement is the average of participants' responses to three post-experiment questionnaire items: (1) "To what extent were you nervous of concerned about how your performance compares to that of the other participants in the session?" (7-point response scale with endpoints of 1 = Not at all and 7 = To a great extent), (2) "How often was your ability to concentrate on the problems disrupted by thinking about how your performance compares to that of the other participants in the session?" (7-point response scale with endpoints of 1 = Never and 7 = Often), and (3) "How often was your ability to concentrate on solving the tasks disrupted by thinking about how your goal compares to that of the other participants in the session?" (7-point response scale with endpoints of 1 = Never and 7 = Often). The Cronbach's alpha = 0.78.

Average Goal Level is the average goal participants set at the start of each of the six rounds regarding the number of grids they aim to solve in the round.

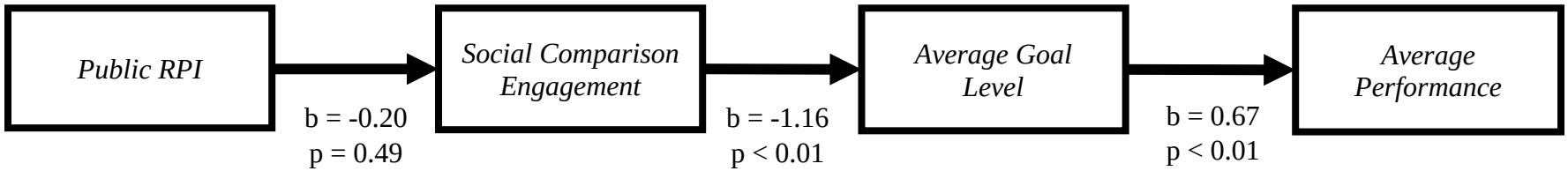
Average Performance is the average number of grids correctly solved across the six rounds.

FIGURE 3
Tests of H1a-H1c Using Multi-Group Path Analysis

Panel A: Private Goal Condition



Panel B: Public Goal Condition



We report one-tailed p-values because the hypotheses involve directional predictions, and we report predicted signs in parentheses. We cluster standard errors by session.

FIGURE 3 (continued)

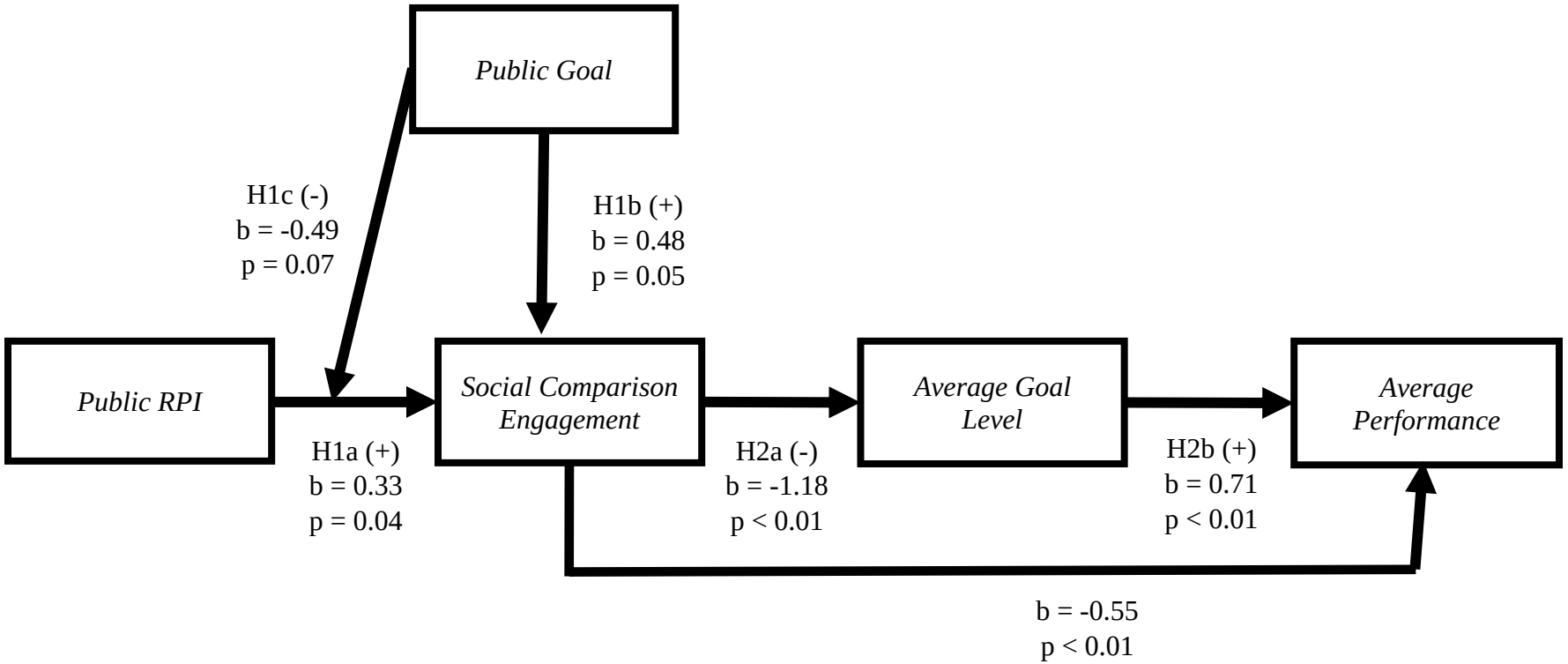
Public RPI is an indicator variable equal to 1 for the Public RPI condition and 0 for the Private RPI condition.

Social Comparison Engagement is the average of participants' responses to three post-experiment questionnaire items: (1) "To what extent were you nervous of concerned about how your performance compares to that of the other participants in the session?" (7-point response scale with endpoints of 1 = Not at all and 7 = To a great extent), (2) "How often was your ability to concentrate on the problems disrupted by thinking about how your performance compares to that of the other participants in the session?" (7-point response scale with endpoints of 1 = Never and 7 = Often), and (3) "How often was your ability to concentrate on solving the tasks disrupted by thinking about how your goal compares to that of the other participants in the session?" (7-point response scale with endpoints of 1 = Never and 7 = Often). The Cronbach's alpha = 0.78.

Average Goal Level is the average goal participants set at the start of each of the six rounds regarding the number of grids they aim to solve in the round.

Average Performance is the average number of grids correctly solved across the six rounds.

FIGURE 4
Supplemental Analyses



We report one-tailed p-values because the hypotheses involve directional predictions, and we report predicted signs in parentheses. We cluster standard errors by session.

SRMR = 0.07. No other fit indices are available due to clustering.

N = 160.

FIGURE 4 (Continued)

Public RPI is an indicator variable equal to 1 for the Public RPI condition and 0 for the Private RPI condition.

Public Goal is an indicator variable equal to 1 for the Public Goal condition and 0 for the Private Goal condition.

Social Comparison Engagement is the average of participants' responses to three post-experiment questionnaire items: (1) "To what extent were you nervous of concerned about how your performance compares to that of the other participants in the session?" (7-point response scale with endpoints of 1 = Not at all and 7 = To a great extent), (2) "How often was your ability to concentrate on the problems disrupted by thinking about how your performance compares to that of the other participants in the session?" (7-point response scale with endpoints of 1 = Never and 7 = Often), and (3) "How often was your ability to concentrate on solving the tasks disrupted by thinking about how your goal compares to that of the other participants in the session?" (7-point response scale with endpoints of 1 = Never and 7 = Often). The Cronbach's alpha = 0.78.

Average Goal Level is the average goal participants set at the start of each of the six rounds regarding the number of grids they aim to solve in the round.

Average Performance is the average number of grids correctly solved across the six rounds.

TABLE 1
Descriptive Statistics – Mean (Standard Deviation)

	Private Goals Condition		**Public Goals Condition**	
Measure	**Private RPI (N = 40)**	**Public RPI (N = 40)**	**Private RPI (N = 40)**	**Public RPI (N = 40)**
Social Comparison Engagement	3.28 (1.15)	3.62 (1.21)	3.77 (1.47)	3.61 (1.67)
Average Goal Level	19.15 (5.10)	17.74 (4.65)	19.64 (6.54)	17.20 (3.92)
Average Performance	19.27 (4.18)	17.58 (5.58)	19.19 (5.78)	17.30 (4.26)

Social Comparison Engagement is the average of participants' responses to three post-experiment questionnaire items: (1) "To what extent were you nervous of concerned about how your performance compares to that of the other participants in the session?" (7-point response scale with endpoints of 1 = Not at all and 7 = To a great extent), (2) "How often was your ability to concentrate on the problems disrupted by thinking about how your performance compares to that of the other participants in the session?" (7-point response scale with endpoints of 1 = Never and 7 = Often), and (3) "How often was your ability to concentrate on solving the tasks disrupted by thinking about how your goal compares to that of the other participants in the session?" (7-point response scale with endpoints of 1 = Never and 7 = Often).

Average Goal Level is the average goal participants set at the start of each of the six rounds regarding the number of grids they aim to solve in the round.

Average Performance is the average number of grids correctly solved across the six rounds.

TABLE 2
Factors Affecting Goal Levels

Dependent Variable = *Goal Level*

Independent Variable	Coefficient	Standard Error	t-statistic	p-value
Public RPI	0.16	0.49	0.33	0.74
Public Goal	0.88	0.48	1.81	0.07
Public RPI × *Public Goal*	-1.30	0.68	-1.90	0.06
Prior Round Performance	0.40	0.05	8.47	< 0.01
Prior Round Goal Level	0.59	0.04	16.68	< 0.01
Prior Round Rank	0.06	0.16	0.38	0.70
Prior Round Goal Attainment	-0.12	0.37	-0.32	0.75
Intercept	0.91	1.21	n.a.	n.a.

Goal Level is the goal level participants set at the start of the round regarding the number of grids they aim to solve in that round.

Public RPI is an indicator variable equal to 1 for the Public RPI condition and 0 for the Private RPI condition.

Public Goal is an indicator variable equal to 1 for the Public Goal condition and 0 for the Private Goal condition.

Prior Round Performance is the number of grids correctly solved in the prior round.

Prior Round Goal Level is the goal level participants set at the start of the prior round regarding the number of grids they aim to solve in that round.

Prior Round Rank is participants' rank at the end of the prior round.

Prior Round Goal Attainment is an indicator variable equal to 1 if participants attain the performance goal in the prior round and 0 otherwise.