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GENDER DIFFERENCES IN PERCEIVED GOAL CONFLICT AND OVERCONFIDENCE – EVIDENCE FROM A REAL-EFFORT EXPERIMENT

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Abstract:
The present research examines gender-specific differences on the perception of goal conflict. In order to empirically test the effects of multiple goal settings on perceived goal conflict, a real-effort experiment was conducted within a real production environment. In total eight experimental groups have been set up, differing by the number and types of goals. Three goal dimensions, commonly set as objectives in production settings, were applied: energy efficiency, output quantity, and product quality. Findings indicate that a higher number of goals increases the perceived level of goal conflict. Moreover, men experienced significantly less goal conflict than women under the same conditions. This gender gap rises with the number of requested targets. A possible explanation for this gender inconstancy may be drawn from overconfidence research, which provides evidence for men to overestimate personal abilities due to a higher level of self-esteem. Nevertheless, irrespective of the number and types of goals, the actual goal achievements indicate no significant differences between men and women.

Keywords: goal conflict, overconfidence, gender differences, real-effort experiment, production

1. INTRODUCTION

Today's working environments are complex and expect their employees to fulfill multiple goals simultaneously. Frequently, the different goals are conflicting with each other. This holds especially true for production settings, where employees often face the classical trade-off between quantity and quality goals. Goal conflict arises, as the workers have to decide whether they speed up their processes in order to meet the quantity target or whether they work more carefully and hence more slowly to fulfill the quality requirements (e.g. Locke, Smith, Erez, Chah, and Schaffer, 1994; Audia, Kristof-Brown, Brown, and Locke, 1996). Given the mounting diversity of the workforce in many production environments, surprisingly hardly any research effort has been spent on the differences in perception of goal conflict regarding diversity aspects such as gender. Drawing from the fact that women represent almost one third of the workforce in the German manufacturing industry (Destatis, 2012), scrutinizing gender differences is of major relevance.

Drawing from insights of overconfidence literature, this paper closes this research gap by providing empirical evidence for gender differences in the perception of goal conflicts and the detrimental consequences of goal conflict on performance. By means of a real-effort experiment in a realistic production setting, a maximum of three conflicting goals is examined. The goals imposed during the experiment are commonly encountered in production environments: energy efficiency, output quantity, and product quality. Especially the aim of energy efficiency is of high relevance to the manufacturing industry, as they suffer from steeply rising costs for resources. To be more precise, European industry prices for natural gases have grown by more than 165% since 2001. (BMWI, 2014).

The experimental premises can be considered as a distinctive feature as the experiment was conducted at the Model Factory for Energy Efficiency (LEP) at the Technische Universitaet Muenchen. Learning factories were originally introduced as new means of engineering education, providing hands-on experience in combination with engineering science (Lamancusa, Jorgensen, and Zayas-Castro, 1997). Next to students, learning-factory-based training may also be targeted at skilled workers or managers, providing the opportunity of risk-free manipulation of production processes (Cachay, Wennemer, Abele, and Tenberg, 2012) by altering influential factors of interest such as cycle times or production quantities.

The LEP provides a realistic learning environment with focus on energy conservation by providing state-of-the-art machinery and equipment for all energy-intensive process steps to manufacture gear shafts. (Karl, Schmidt, and Reinhart, 2013; Asmus, Karl, Graßl, Mohnen, and Reinhart, 2013). By integrating the strengths of laboratory experiments, e.g. the given comparability of participants' performance by controlling for external parameters, into a realistic production environment, the LEP offers unique prerequisites for enhancing the knowledge base in the field of goal conflicts.

2. THEORETICAL BACKGROUND AND HYPOTHESES

Theory on goal setting, goal conflict and the more recent literature on overconfidence provide insights how people might react in our experimental setting. Hence, in the following theory-based hypotheses are elaborated.

2.1. Goal setting

The positive impact of goal setting on employee motivation and performance has been investigated intensively in literature (e.g. Mento, Steel, and Karren, 1987; Locke and Latham, 1990; Fatseas and Hirst, 1992; Locke and Latham, 2002). Therefore goal setting combined with feedback information was shown to substantially reduce recipients' level of energy consumption (Becker, 1978; Van Houwelingen and Van Raaij, 1989; Abrahamse, Steg, Vlek, and Rothengatter, 2007; Attari, Gowrisankaran, Simpson, and Marx, 2014). In particular, specific and challenging goals induce higher efforts towards goal attainment and hence lead to higher levels of performance.

2.2. Goal conflict

However, employees are often confronted with multiple performance goals, which have to be pursued simultaneously. If the accomplishment of one goal is considered to be interfering with the achievement of another goal, this situation is likely to result in goal conflict (Emmons and King, 1988). Locke et al.

(1994) define goal conflict as the degree to which individuals perceive their multiple goals to be incompatible. The reasoning behind goal conflict is based on the fact, that individuals are limited in their capacities such as time or cognitive resources (Halford, Baker, McCredden, and Bain, 2005; Cheng, Luckett, and Mahama, 2007).

Locke et al. (1994) identified three types of goal conflict. The first type of goal conflict emerges when the difficulty level of an externally assigned goal diverges from a previously chosen, personal goal level. The second conflict type arises when individuals are required to achieve multiple goals in several kinds of tasks and hence have to prioritize one goal at the expense of another. This goal conflict is referred to as 'between-tasks goal conflict'. The third type of goal conflict describes the trade-off between multiple goals when performing a single task, a so-called 'within-tasks goal conflict'. In this case, the individual has to decide which performance dimension of the task is given preference. The current study focuses on the latter type, the within-goal conflict.

Finding ways to resolve the goal conflict requires individuals to divert their attention away from the task, which has negative consequences on goal attainment (Kehr, 2003). Furthermore, the urge of sharing scarce resources between a higher number of goals and therefore experiencing goal conflict harms emotional well-being and leads to tension and pressure (Emmons and King, 1988; Locke et al., 1994).

Nowadays individuals spend more attention on resolving multiple goal conflicts. The majority of the previous studies focus on the goal conflict between two interfering goals. In addition to three different two-goal conditions, the current investigation examines also the interaction of up to three conflicting goals to simulate the increasing complexity of today's working environments. Hence Hypothesis 1 suggests that a higher number of goals enhance the perception of goal conflict.

H1: A higher number of goals will increase the perception of goal conflict.

Cheng et al. (2007) indicate that goal conflict is associated with the perceived probability of goal attainment, which is referred to as 'goal difficulty'. According to their findings, goal conflict increases with a growing level of perceived goal difficulty. The perception of goal difficulty in turn is closely related to self-esteem and self-confidence. Following Hall's (1976) psychological success model, subjects high in self-esteem are more likely to adopt difficult goals as their expectation of goal attainment is higher. Although this model was not without controversy (e.g. Hollenbeck and Brief, 1987), subsequent studies confirmed the relationship between self-confidence and goal choice (e.g. Levy and Baumgardner, 1991). This leads to the assumption that individuals with high self-esteem perceive a lower goal difficulty, as they assess their probability of failure to be smaller compared to individuals with low self-esteem.

2.3. Overconfidence

The reasons why individuals high in self-esteem tend to choose challenging, often hardly achievable goals can be found in literature on overconfidence. Overconfidence describes the "tendency for people to overestimate their knowledge, abilities and the precision of their information." (Bhandari and Deaves, 2006, p. 5). Three types of overconfidence are generally observed (Moore and Healy, 2008): Firstly, the better than average effect relates to the phenomenon that the majority of people evaluates themselves to be above average. The second strain of overconfidence deals with the overestimation of one's actual ability, performance, level of control, or chance of success. This form of overestimation is considered to be relevant within this paper. A third form of overconfidence involves the exorbitant certainty regarding the accuracy of one's beliefs (Lichtenstein, Fischhoff, and Phillips, 1982).

There is ample empirical evidence for the prevalence of gender differences in overconfidence, usually stating higher levels of overconfidence for men. Women tend to underestimate their performance (e.g. in mathematics, problem solving, and science), whereas men are generally overly optimistic regarding their performance (e.g. Bhandari and Deaves, 2006; Campbell and Hackett, 1986; Deaux and Farris, 1977). A reason for this phenomenon may be found in the self-attribution bias. While women are more likely to explain good performance with luck and attribute bad outcomes to a lack of their own abilities, men usually ascribe success to their own abilities and blame failures to bad luck (Deaux and Farris, 1977).

Drawing from the premise that the perception of goal difficulty is influenced by self-confidence, with higher self-esteem resulting in a lower level of perceived goal difficulty, lower goal difficulty resulting in lower goal conflict, and the tendency of men to be overly confident, Hypothesis 2 proposes the following:

H2: Men will perceive less goal conflict than women.

Resulting from the presumption that men show a lower sensitivity for goal conflict and that a mounting number of goals will generally enhance the perceived goal conflict, we expect that women will be affected more intensively by a rising number of goals.

H3: Women will experience a higher rise in goal conflict than men when facing an increasing number of goals.

Researchers agree upon the detrimental influence of goal conflict on performance (e.g. Harlow and Cantor, 1994; Locke et al. 1994; Slocum, Cron, and Brown, 2002). Although men perceive goal conflict to be less severe than women, this claim is nevertheless valid for both men and women. Therefore we hypothesize that performance will be negatively affected by goal conflict for both genders.

H4: Although men perceive goal conflict to be less intense, the performance will be negatively influenced by goal conflict for both men and women.

3. EXPERIMENTAL SETTING

3.1. Design

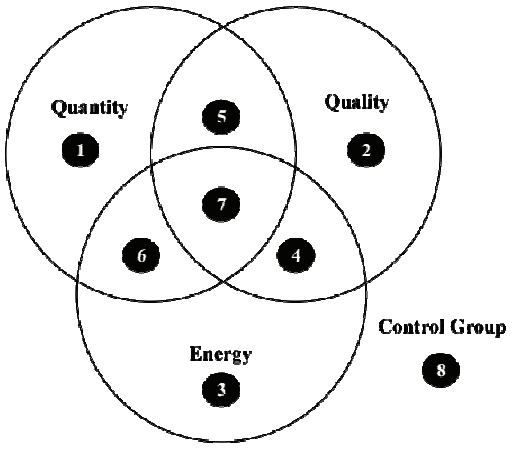
Within the experimental setting, participants were randomly assigned to one of eight conditions. According to figure 1, the design was composed by seven treatment groups plus one control group.
The defining features for each group were the number and types of goals participants were assigned to. The claimed goals can be categorized by quantity, quality and energy:

(1) Quantity: Produce as many gearboxes as possible in a given time
(2) Quality: Reach an average bolt torque of 2.0 to 2.5 Nm for all gearboxes
(3) Energy: Expend as little air as possible

Whereas the control group had no targets, subjects in condition 1, 2, and 3 had one goal each; participants in group 4, 5, or 6 were imposed with two goals. Participants in the final experimental condition, group 7, were asked to fulfill all three targets simultaneously.

The given task was to screw gearboxes together by means of a pneumatic screwdriver. Therefore the experiment can be categorized as a real-effort experiment (Van Dijk, Sonnemans, and Van Winden, 2001).

Figure 1: Classification of the experimental groups



3.2. Participants

In total 240 subjects (191 males; 49 females) participated in the experiment. All of them were university students with an average age of 24 (SD=3.37, ageMin=17, ageMax=47). Participants were distributed to eight different conditions under the intended premise of a 20% female share in every group. Given this premise, females and males were randomly assigned to the treatment groups. Hence each condition would consist of 30 individuals (24 men, 6 woman). However, considering that one participant had to be excluded due to premature dropout of the experiment, a slight deviation occurred. The final sample was reduced to 239 persons, with condition 5 containing 23 men and 6 women. Additionally condition 3 differed from the standard by including 23 men and 7 women. Each person spent around 45 minutes for the experiment and was remunerated with a fixed wage of 9 euros. Accordingly no monetary incentives drive the experimental results.

3.3. Procedure

In order to test the hypotheses, a real-effort experiment was conducted at the Model Factory for Energy Efficiency (LEP) at the Technische Universitaet Muenchen in July and August 2013. Following figure 2, the experimental procedure was identical for all eight groups starting with a presentation including a video to introduce the working station and to explain all necessary instructions.

Figure 2: Experimental procedure

Experimental procedure	Time
Presentation & video	10 min
Trial round	5 min
Presentation	5 min
First round	5 min
Break & presentation	1 min
Second round	5 min
Break & presentation	1 min
Third round	5 min
Questionnaire	10 min

Independent of their group, participants took part in a five-minute trial round to get acquainted with the equipment, the work place and the task. This trial round was excluded from the experimental evaluation. It was ensured that they got familiar with handling the pneumatic screwdriver and adjusting the air pressure level. For regulation purposes, a pressure-balancer was installed next to the working station. With the help of an air flow meter, feedback on the current level of accumulated air consumption over time was given continuously to the participants. By adjusting the air pressure level in line with the feedback information, all experimental goals could be affected: the screwdriver´s speed (quantity), the torque level (quality) and the air consumption (energy).

Subsequently, a presentation introduced the subjects to their individual goal setting, dependent on the condition. Participants then started with the first of three rounds by screwing gearboxes together. After 5 minutes, a one-minute break was taken before the next screwing round with an identical lap time began.

During the break subjects were again exposed to the presentation showing their individual goals. Concurrently, the experimenter recorded all results on a scoring sheet. However, no further intervention took place between the rounds. The same task within the same time frame and the same goals had to be performed three times in total. Since only the group-specific goal setting varied, a very high level of comparability both between the rounds and between the experimental groups was ensured. After concluding the third round, all subjects completed a questionnaire. The primary objectives of this questionnaire were to capture the perceived level of goal conflict and to gain additional information on participant's demographics, attitudes and cognitive abilities.

3.4. Measures

Goal achievement
The task performance was evaluated by recording the amount of screws assembled in all finished and unfinished gearboxes (quantity), the torque levels (quality) and the used amount of compressed air (energy) after each round. In this regard it must be noted that a gear box was considered as finished if all 6 screws were tightened properly.

Goal conflict
As part of the questionnaire, subjects with more than one objective were asked to indicate their perceived goal conflict on a five-level Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Based on previous research by Locke et al., 1994 and Locke and Latham, 2013, three items were questioned to measure the experienced goal conflict. The items read:

i) During the experiment I felt not being capable to reach all given goals;
ii) During the experiment I was exposed to conflicting goals;
iii) During the experiment I had to achieve too many goals.

Additionally, one particular question was developed to account for the exceptional setting of three goals:

iv) To which degree during the experiment did you feel a conflict respective what goals to focus on most.

The corresponding Likert-scale went from 1 (no conflict) to 5 (strong conflict). Finally, the average of the answers to the four questions was utilized to measure the overall perceived goal conflict and hence to test the considered hypotheses.

4. RESULTS

For the purpose of data analysis, only those groups were included which faced a goal conflict by being required to fulfil more than one goal. This is valid for group 4, 5, 6, which had to pursue two goals each, and group 7, imposed with three goals.

4.1. Hypothesis 1

Hypothesis 1 stated that a higher number of goals increases the perception of goal conflict. An analysis of variance (ANOVA) shows that the effect of the number of goals on goal conflict is highly significant [$F(3, 355)= 8.12$, $p=.000$]. Post hoc analyses using the Bonferroni test indicate that group 7 experiences a significantly higher goal conflict ($M=3.49$, $SD=.69$) than group 5 ($M=2.99$, $SD=.78$) and group 6 ($M=3.1$, $SD=.74$).

Table 1: Bonferroni comparison for differences in goal conflict between groups

Row mean - Column mean	4	5	6
5	-.241 (.156)		
6	-.133 (1.00)	.108 (1.00)	
7	.259 (.101)	.500 (.000)	.392 (.002)

Contrary to expectations, no statistically significant difference in goal conflict can be observed between group 7 and group 4 ($M=3.23$, $SD=.65$). Nevertheless, the goal conflict perceived did not statistically differ between the groups in the two-goal-conditions (4,5, and 6) [$F(2, 264)=2.44$, $p=.089$].
Based on these results, Hypothesis 1, proposing that a higher number of goals will increase goal conflict, can be confirmed.

4.2. Hypothesis 2

Hypothesis 2 claimed that men perceive less goal conflict than women. A t-test was conducted to evaluate the differences in the perception of goal conflict between men and women, including the participants of all two-goal and three-goal conditions.

The results show a highly significant effect of gender on goal conflict. Women [M=3.51, SD=.09] experience a considerably higher goal conflict than men [M= 3.12, SD=.04, t(355)=4.03, p(two-tailed)=.0001]. This result gives support to Hypothesis 2, presuming that men will perceive less goal conflict than women.

4.3. Hypothesis 3

The assumption of Hypothesis 3 was that women experience a higher increase in goal conflict than men when facing a mounting number of goals. To assess the gender differences in goal conflict under a rising number of goals, a series of t-tests was conducted. Those compared the mean goal conflict of female and male participants in each group.

Table 2: Comparison of mean goal conflict by group and gender

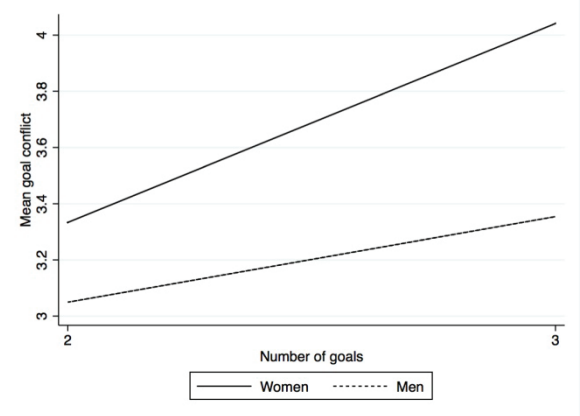
	4	5	6	7
Men	3.228	2.927	3.000	3.354
Women	3.250	3.250	3.500	4.042
Delta	.022	.323	.500	.688
p	0.9008	0.1168	0.0095	0.0001

Note: t-test comparison between female and male participants

No statistically significant differences can be observed between men and women in group 4 [t(85)=.125, p=0.9008] and group 5, respectively, [t(88)=1.58, p=.1168], whereas the perceived goal conflict differed significantly between male and female participants in group 6 [t(88)= 2.653, p=0.0095] and group 7 [t(88)= 4.115, p=0.0001]. The gap between men and women is greatest for participants in group 7 [Δ=.688]. Both gender experienced a significantly higher goal conflict in the three-goal condition compared to the two-goal conditions. The increase in goal conflict was higher for female participants [M(two goals)=3.333, M(three goals)=4.024, Δ=.691, t(70)=3.803, p=.0003], and less severe for male participants [M(two goals) =3.049, M(three goals)=3.354, Δ=.305, t(283)=3.166, p=.0017].

These results give support to Hypothesis 3, proposing that a rise in the number of goals will affect women more heavily than men. Figure 3 illustrates the gender differences in goal conflict for different numbers of goals.

Figure 3: Gender differences in goal conflict for a rising number of goals



4.4. Hypothesis 4

H4 dealt with the claim that although men perceive goal conflict to be less intense, the performance will be negatively affected by goal conflict for both men and women. Firstly, several regression analyses clarified whether goal conflict has a general impact on performance, considering both men and women. In all regression analyses, only those groups were included who were required to fulfill the specific goal.

A linear regression analysis revealed a significant, negative influence of goal conflict on the number of bolts assembled [b=-5.0963, t(270)=-3.76, p=.000]. A significant influence of goal conflict on air consumption per bolts could not be confirmed, although results are close to significance [b=.285, t(267)=1.95, p=.052]. A logistic regression was conducted to test whether goal conflict affected the accomplishment of the quality goal. For this purpose, a variable was generated that took the value 1 for reaching the quality goal (average torque between 2.0 and 2.5 Nm, n=9) and the value 0 for missing the given goal (n=110). No statistically significant effect could be observed [b=.259, z(264)=.74, p=.461].The results suggest that the performance deteriorates with a rising number of goals. To control for gender effects, a series of t-tests was conducted comparing the mean performance of men and women for the individual goals in each treatment group. There were no statistically significant differences in the performance between men and women for none of the goals, except the quality goal in group 5 and the quantity goal in group 7, where men performed better.

Table 3: Comparison of mean performance between men and women

Group	Goals	Men	Women	p
4	Energy	8.692	9.181	.2323
	Quality	.339	.270	.1521
5	Quantity	82.625	82.833	.9623
	Quality	.345	.174	.0181
6	Quantity	93.583	88.167	.2015
	Energy	7.416	7.267	.6704
7	Quantity	72.417	62.500	.0010
	Quality	.280	.242	.5578
	Energy	8.047	8.923	.0796

Note: T-test comparisons between female and male participants

To conclude, performance declines with a mounting number of goals, regardless of gender. Nevertheless, men perceive a lower level of goal conflict. Given these results, Hypothesis 4 can be confirmed.

5. DISCUSSION

Both the motivational impact of goal setting and the underlying traits of goal conflict are thoroughly researched within organizational behavior literature (e.g. Locke et al., 1994; Locke and Latham, 2002). In accordance to this, the experimental analysis of Hypothesis 1 showed an increase in perceived goal conflict due to a higher number of goals. Strikingly, participants imposed to the combination of the energy and the quality goal showed no statistically significant difference to the three-goal-condition. These two targets can be considered as the most conflicting goals: conserving energy requires the participants to reduce air pressure, whereas reaching a certain level of bolt torque urges the subjects to increase air pressure. This might explain why participants in group 4 felt a high goal conflict at a similar level to group 7.

Apart from the number of goals, differences in the perception of goal conflict with regard to demographic variables are rarely examined in the existing literature. Therefore, Hypothesis 2 analyzed gender-specific effects to the extent of perceived goal conflict. Results indicate that men feel generally less goal conflict as compared to women. One reason may be the observation of men stating higher levels of overconfidence than women (e.g. Campbell and Hackett, 1986; Deaux and Farris, 1977). As men have more confidence in their own abilities, they experience less doubt in completing contrary goals and hence have a lower sensitivity for goal conflict.

One may also argue with gender differences in overconfidence to explain the outcomes for Hypothesis 3. They disclose that an increasing number of goals affects woman stronger than men. Although both gender showed an intensification of perceived goal conflict under the three-goal condition in comparison to the two-goal conditions, the rise was obviously greater for women. This is consistent with the separated effects of the number of goals and gender characteristics from Hypothesis 1 and 2.

The intention of Hypothesis 4 was to test the relation between a gender-specific sensation of goal conflicts and the actual task performance. Interestingly, no significant gender differences in goal achievements could be found for almost all experimental groups. Exceptions occurred for the quality goal in group 5 and the quantity goal in group 7. In both cases men performed significantly better than women. This may be derived from the fact that men in group 5 got less distracted by the overly challenging quality goal. Men's higher self-confidence could also be accounted for their strong focus and performance on the quantity goal in group 7. Nevertheless, for all other goal-settings the prejudicial influence of goal conflict on performance was proven to be valid for both genders equally, independent of disparities on perceived goal conflicts.

6. CONCLUSIONS

To examine gender-specific effects on perceived goal conflict, a real-effort experiment was conducted at the LEP. An identical production task with a highly comparable procedure was designed for all participants. Individuals had to assemble gearboxes with the help of a pneumatic screwdriver. In total 239 participants were equally distributed to eight experimental groups, differing by the number and types of goal. Three goal dimensions, commonly imposed in production environments, were applied: output quantity, product quality and energy efficiency.

Experimental findings indicate that a growing number of goals enhance individual's perception of goal conflict. However, men feel significant less goal conflict than woman. This gender gap mounts with the number of imposed targets. Interestingly, virtually no significant gender disparities in the actual task performance data had been found. The detrimental influence on performance of a higher number of goals affected men and women almost identically.

The results constitute considerable implications for practical goal settings within production environments. Therefore the chosen number of conflicting goals can regulate workers gender-specific level of perceived stress and the overall performance. Though it must be noted that the present experimental findings are limited to the constraint of most participants being students. Hence the results may not be entirely representative for an average workforce population. Notwithstanding, the real-effort experiment attempts to be as close as possible to a realistic production environment, but still features elements of a laboratory setting.

Future research should replicate the scenario in a complete industrial production setting to validate the experimental results. Furthermore, to gain additional insights in human behavior apart from gender, other demographic variables, such as age or cultural background, should be tested regarding their influence on the perception of goal conflicts.

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