Moderation in the Effect of Manager Feedback on Call Worker Fatigue

Introduction

This research aims at understanding how manager feedback impacts the tiredness of call workers, and whether or not the relationship between the two is conditional upon the potentially controlling nature of the feedback. In other words, does control moderate the influence of feedback on fatigue? If so, at what levels of control? For instance, feedback, the predictor, could interact with the moderator, theorised to be control, and at a certain level of control, the two could together influence the outcome, fatigue of call workers. It is hypothesised that controlling feedback would lead to higher fatigue, and that non-controlling feedback would decrease tiredness.

Research questions and hypotheses

I postulate the following:

Research question Q1. Is the direct effect of manager feedback on call worker fatigue conditional upon levels of manager control?

Null hypothesis H1. Manager control does not moderate the direct effect of manager feedback on call worker fatigue.

Research question Q2. Is the conditional direct effect of manager feedback on call worker fatigue significant at high, moderate, or low manager control?

Research question Q3. Where in the range of values for manager control is the conditional direct effect of manager feedback on call worker fatigue significant?

Data analysis method and justification

This quantitative research uses data from 209 employees at a British call centre, in the form of the fatigue_data data file. The feedback variable refers to the average score on a

7-point Likert scale of each respondent's answer to prompts about the feedback on their work provided by their manager. Likewise, control refers to responses to prompts about the controlling nature of the feedback, and energy contains responses to prompts regarding tiredness due to work.

To test for moderation in this case, I will first use a linear model with a multiple regression on fatigue. I will do this so I can get a first look at potential moderation. The model will allow me to see whether the interaction term is statistically significant: if it is, I can confirm the presence of moderation. I will then bootstrap the interaction term, with a 95% confidence interval, to get a definitive answer about the presence of moderation. If I do find moderation, I will use two methods to probe the moderation as I need to find out more about the moderator's effect: the pick-a-point technique, because it is widely used, and the Johnson-Neyman technique, because it allows for more detail than arbitrarily chosen values. I'll then find the exact values of control for which the conditional effect becomes significant, and, for the sake of visualisation, I'll plot the conditional effect of feedback as a function of control in the data.

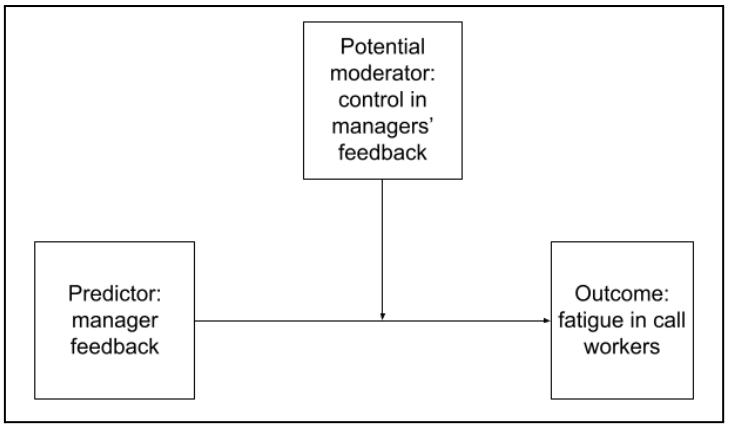

Figure 1. *Diagram of the three variables' relationship.*

Preliminary analysis

First I'll use the favstats() function to summarise the data.

min	Q1	median	Q3	max	mean	sd
1.25	1.5	2.5	3.25	6.25	2.545754	1.080961

Table 1. *Summary statistics on fatigue in the data file.*

Now I will run a multiple regression using feedback and control as predictor variables, plus feedback*control as an interaction term. This way, the feedback variable's effect on fatigue will be a linear function of the moderator, control. The interaction term will indicate the degree to which the controlling nature of feedback influences its relationship with fatigue.

```
Call:
lm(formula = fatigue ~ 1 + feedback + control + feedback *
control,
    data = fatigue_data)

Residuals:
    Min      1Q  Median      3Q     Max
-1.7596 -0.8795 -0.0549  0.6799  3.7119

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)       4.38541    1.03328   4.244 3.32e-05 ***
feedback         -0.43244    0.19424  -2.226   0.0271 *
control          -0.69868    0.35050  -1.993   0.0475 *
feedback:control  0.16688    0.06738   2.476   0.0141 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.056 on 205 degrees of freedom
Multiple R-squared:   0.06,     Adjusted R-squared:  0.04625
F-statistic: 4.362 on 3 and 205 DF,  p-value: 0.005293
```

Figure 2. *Multiple regression with feedback, control and feedback*control.*

The interaction term has a slope estimate of 0.16, a SE of 0.06, and a t value of 2.47, larger than 1.96. The two predictor variables, feedback and control, interact, and influence fatigue: the relationship between feedback and exhaustion is moderated by control.

Now I'll bootstrap the interaction term for a 95% confidence interval.

	2.5%	97.5%
(Intercept)	2.71715484	6.0915434
feedback	-0.74635052	-0.1250716
control	-1.29493513	-0.1182952
feedback:control	0.05500516	0.2811412

Table 2. *Bootstrap of the interaction term for a 95% confidence interval.*

This 95% confidence interval does not include 0 so I can reject the null hypothesis. I can definitely reject the null hypothesis H1 and find my answer to research question Q1: the direct effect of manager feedback on call worker fatigue is conditional upon levels of manager control.

Primary analysis

Now it is clear there is moderation, I need to probe it to understand it better. First I'll use the pick-a-point technique with the mean, one standard deviation above and one below the mean as values for the moderator. I resort to this technique as it is widely used.

```
Call:
pickapoint(model = mod.model, dv = "fatigue", iv = "feedback",
    mod = "control")
Conditional effects of  feedback  on  fatigue  at values of  control
  control     Effect         SE          t          p         llci
 1.434953 -0.1929786 0.11254669 -1.7146533 0.08792745 -0.414882468
 2.677831  0.0144299 0.07791938  0.1851902 0.85326388 -0.139200694
 3.920709  0.2218384 0.11620921  1.9089568 0.05767118 -0.007286787
       ulci
 0.02892535
 0.16806050
 0.45096351

Values for quantitative moderators are the mean and plus/minus one SD from the mean
Values for dichotomous moderators are the two values of the moderator
```

Figure 3. *Pick-a-point method with the mean and +/- 1 SD as values of the moderator.*

Interpretation

At one SD below the mean, the effect of feedback on fatigue is -0.19 with a standard error of 0.11 a t-value of -1.71. At the mean, the effect is 0.01 with an SE of 0.078 and a t-value of 0.18. At 1 SD above the mean, so with a high level of the moderator, control,the effect is 0.22, with an SE of 0.11 and a t-value of 1.90. Neither of these estimates are statistically significant so it seems, at least using this technique, that the null hypothesis cannot be rejected.

The values used for the pick-a-point method were used arbitrarily, so I still need to verify those results with the Johnson-Neyman technique, since it uses critical values in the t-value distribution to find the range (or ranges) in which the conditional effect of feedback on fatigue is significant.

```
Call:
jn(model = mod.model, dv = "fatigue", iv = "feedback", mod = "control")

Conditional effects of  feedback  on  fatigue  at values of  control
 control  Effect     se       t      p    llci   ulci
       1 -0.2656 0.1352 -1.9637 0.0509 -0.5322 0.0011
       2 -0.0987 0.0890 -1.1082 0.2691 -0.2743 0.0769
       3  0.0682 0.0816  0.8361 0.4040 -0.0926 0.2290
       4  0.2351 0.1202  1.9552 0.0519 -0.0020 0.4721
       5  0.4019 0.1770  2.2705 0.0242  0.0529 0.7510
       6  0.5688 0.2394  2.3762 0.0184  0.0968 1.0408
```

Figure 4. *Johnson-Neyman method to probe the moderation.*

Interpretation

This shows that the conditional effect of feedback on fatigue is negative and significant when control is very low (for the value 1), negative and insignificant when control is low (for the value of 2), positive and insignificant when control is moderate (value of 3), and positive and significant when control is high (for the values from 4 to 6). This answers research question Q2: the conditional direct effect of manager feedback on call worker feedback is significant at high manager control. Manager feedback positively predicts fatigue, but only when combined with high manager control. This is different to what the pick-a-point technique indicated but is a more satisfactory response since it overcomes the limitations of pick-a-point.

To find the exact values of control for which the conditional effect becomes significant, I'll use the modplot package.

```
[1] 4.030249
```

Figure 5. *Output from the jnt() function from the modplot package.*

Interpretation

The function has returned a single value, meaning that the conditional effect is significant either below or above this value for the moderator. The Johnson-Neyman results (as well as the pick-a-point results, since they describe an increase in the t-value, which becomes almost significant at 1 SD above the mean, as control increases) indicate that the conditional effect is significant above the value of 4.03, not below. When control is lower than 4.03, the conditional direct effect of feedback on fatigue is non-significant. When control is higher than 4.03, the conditional direct effect of feedback on fatigue is positive and significant, thereby answering research question Q3. When the effect of feedback on fatigue is conditioned on the level of control, the relationship not only changes in direction and significance.

To help visualise this, I'll plot the relationship between feedback and fatigue across the range of values of control.

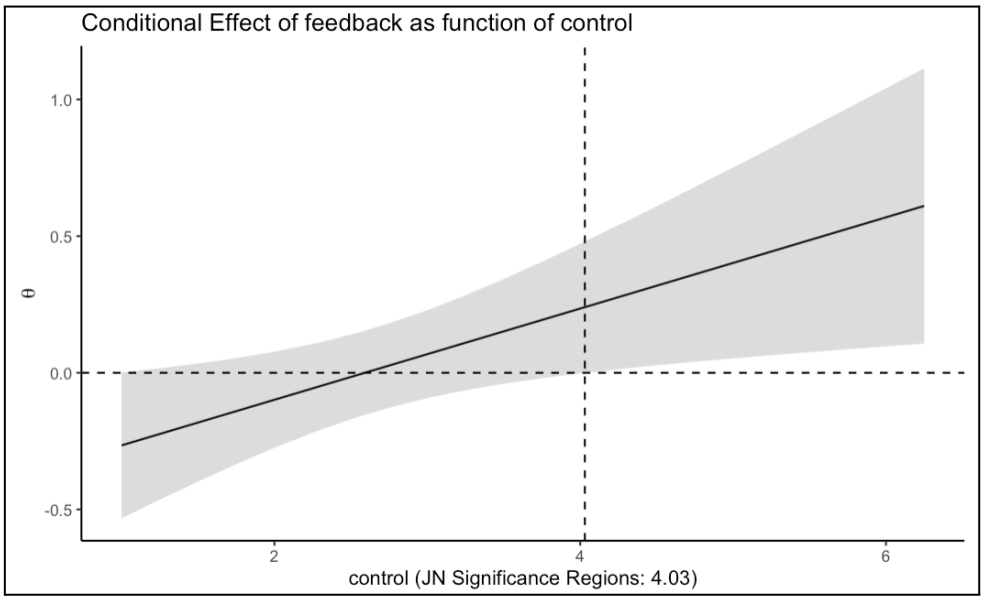

Figure 5. *Plot of the conditional effect of feedback as a function of control.*

The Johnson-Neyman value shows the regions of significance with dotted lines, and the confidence interval is highlighted around the conditional effect.

Lessons for future research

Future research should use a more equal sample in terms of gender, and using responses from workers in other sectors and countries would help verify the validity of these findings on a larger scale. Future research could also look into the potential moderating role of a relaxed work atmosphere (ability to work from home, having more time off, longer lunch breaks, etc) in the relationship between feedback and worker fatigue.

Implications for practice

This study has shown that high levels of control in the feedback given to call workers moderates the effect of feedback on their fatigue. These results imply necessary changes for the wellbeing of workers: managers' feedback should be constructive, otherwise it risks being counter-productive and tiring call workers, leading to a decrease in wellbeing and productivity.