# Inconclusive necessity effects of basic psychological need satisfaction and frustration on wellbeing at work: A comment on Olafsen and Marescaux (2025)

Kimmo Sorjonen*, Bo Melin, & Marika Melin

Department of Clinical Neuroscience,
Karolinska Institutet, Stockholm, Sweden

* Corresponding author: kimmo.sorjonen@ki.se

Olafsen and Marescaux (2025) conducted analyses with the necessary condition analysis (NCA) and concluded that both satisfaction and low frustration of autonomy and low frustration of competence constitute necessities for employee wellbeing. However, it has been established that necessity effects in the NCA may be spurious. Here we show that the necessity effects reported by Olafsen and Marescaux were not significantly stronger than could be expected due to correlations between variables, meaning that these necessity effects may have been spurious. It is important for researchers using the NCA to be aware of its susceptibility to spurious findings in order not to overinterpret findings. We recommend researchers using the NCA to scrutinize their findings by estimating ranges of spuriousness, i.e., effects that could be expected due to the correlation between variables. If the estimated necessity effect does not fall above the range of spuriousness, conclusions of necessity should probably be suspended.

*Keywords:* basic psychological needs; employee wellbeing; necessary condition analysis (NCA); self-determination theory (SDT); spurious effects

## Introduction

The necessary condition analysis (NCA, Dul 2016) evaluates necessity effects by estimating the size of the (semi-) empty upper-left corner in a XY-plot as a percentage of the space given by min and max values on X and Y. A (semi-) empty space would be seen to suggest that a low value on X precludes a high value on Y and the larger the space, the stronger the necessity effect. Statistical significance of the necessity effect may be evaluated through permutations (Dul et al. 2020). For example, in Fig 1A the size of the (semi-) empty space in the upper-left corner above the linear regression function and the step-function is 9.655 and 8.341, respectively. As the size of the dashed square is (13.387-7.279) × (22.786-17.437) = 32.672, the necessity effects are 9.655/32.672 = 0.296 (called ceiling regression with free disposal hull, CR-FDH) and 8.341/32.672 = 0.255 (called ceiling envelopment with free disposal hull, CE-FDH), respectively. Both of these effects are statistically significant ($p < .001$) according to the permutation test in NCA.

Self-determination theory (SDT, Ryan and Deci 2017) posits that fulfillment of basic psychological needs (e.g., autonomy, competence, and relatedness) is essential for human flourishing and wellbeing. A large body of research has indicated, for example, associations between satisfaction of basic needs and employee wellbeing (Slemp et al. 2018; Van den Broeck et al. 2016). Conversely, need frustration appears to be associated with diminished engagement and wellbeing (Niemiec et al. 2022; Olafsen et al. 2017; Trépanier et al. 2016). However, associations do not automatically indicate that need satisfaction and/or lack of need frustration are necessary conditions for employee wellbeing. In an attempt to evaluate necessity, Olafsen and Marescaux (2025) conducted analyses with the NCA and concluded, based on statistically significant necessity effects, that both satisfaction and low frustration of autonomy and low frustration of competence constitute necessities for employee wellbeing. Olafsen and Marescaux interpreted their findings within the SDT framework.

However, it has been established that a necessity effect of X on Y in the NCA may be a spurious consequence of a correlation between X and Y which, in turn, may be a spurious consequence of an impact by a confounding variable Z on X and Y. For example, data in Fig 1A were generated by the model in Fig 1B without any direct effects between X and Y, meaning that the necessity effect in Fig 1A is spurious. Sorjonen and Melin (2025) proposed that findings from the NCA should be scrutinized by estimating a "range of spuriousness", i.e., a range of necessity effects that can be expected simply due to the correlation between X and Y. Necessity effects that fall within (or below) this range are not significantly stronger than can be expected even

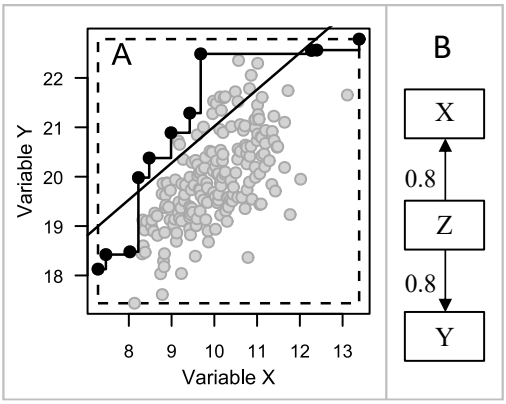


Fig 1. (A) Illustration of the necessity effect as the size of the (semi-) empty space above a linear regression function (CR-FDH) and a step-function (CE-FDH) in the upper-left corner in a XY-plot. Solid black markers = ceiling points with a higher or equal value on Y compared with all points with a lower or equal value on X; (B) Data generating model for the data in panel A. Note: Simulated data.

without X being necessary for Y and should, therefore, not be seen to support conclusions of necessity. Given the NCA's susceptibility to spurious findings, the objective of the present study was to scrutinize the results and conclusions of necessity by Olafsen and Marescaux through the method proposed by Sorjonen and Melin.

## Method

### *Data*

We refer to Olafsen and Marescaux (2025) for more comprehensive information on the study samples, used instruments, procedures, etc. In short, Olafsen and Marescaux analyzed data from three samples: (1) Members of the general working population in the UK and the USA ($N$ = 494, 50% women, mean age = 37 years); (2) Employees in two Norwegian organizations ($N$ = 604, 65% women, mean age = 44 years); (3) Employees in the Norwegian Dental Hygienist Association ($N$ = 299, 96% women, mean age = 43 years). Of these 299 respondents, 167 also responded at a second occasion 6 months later.

In all three samples, data were collected on autonomy satisfaction, autonomy frustration, competence frustration, and work engagement. Moreover, in sample 1, data were collected on eudaimonic wellbeing and work stress; in sample 2 on life satisfaction, positive affect, and negative affect; and in sample 3 on cynicism and somatic complaints. It should be noted that Olafsen and Marescaux analyzed data on additional variables, e.g., competence satisfaction and emotional exhaustion. Here, we focus on variables that Olafsen and Marescaux emphasized in their conclusions.

Olafsen and Marescaux used autonomy satisfaction, autonomy frustration, and competence frustration (i.e., measures of satisfaction and frustration of basic psychological needs) as predictors and the other variables as outcomes and as indicators of employee wellbeing. Correlations and necessity effects (CE-FDH) for the 39 combinations of predictors and outcomes are presented in Table 1. We present all correlations as positive, meaning that negatively worded variables should be interpreted as reversed, e.g., "autonomy frustration" as "lack of autonomy frustration" and "work stress" as "lack of work stress", etc.

### *Analyses*

Following Sorjonen and Melin (2025), for each of the 39 effects in Table 1 we generated 1000 random datasets (i.e., 39 × 1000 = 39,000 datasets in total) with two variables (X and Y) with the same sample size and correlation between X and Y as in the data used by Olafsen and Marescaux. We estimated the necessity effect (CE-FDH) in each of the generated datasets and a 95% bias-corrected and accelerated confidence interval across the 1000 necessity effects. This confidence interval gives a "range of spuriousness" indicating the size of the necessity effect that can be expected simply due to the correlation between X and Y even if X would have no direct effect on Y, e.g., if data were generated as in Fig 1B. Empirically estimated necessity effects should be above this range of spuriousness before claiming that X is necessary for Y.

We conducted analyses with R 4.4.3 statistical software (R Core Team 2025) employing the MASS (Venables and Ripley 2002), NCA (Dul 2021), and coxed (Kropko and Harden 2020) packages. The analytic script, which also generates the data, is available at the Open Science Framework at https://osf.io/htc6e/.

Table 1. Correlations and necessity effects in three samples, reported by Olafsen and Marescaux (2025)

| | | | X = AS | | | X = AF | | | X = CF | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample | N | Y | # | $r_{xy}$ | $d$ | # | $r_{xy}$ | $d$ | # | $r_{xy}$ | $d$ |
| 1 | 494 | WE | 1 | .61 | .213 | 14 | .44 | .090 | 27 | .38 | .213 |
| 1 | 494 | EWB | 2 | .63 | .138 | 15 | .47 | .023 | 28 | .37 | .133 |
| 1 | 494 | WS | 3 | .21 | .051 | 16 | .37 | .148 | 29 | .41 | .014 |
| 2 | 604 | WE | 4 | .47 | .107 | 17 | .32 | .000 | 30 | .28 | .170 |
| 2 | 604 | LS | 5 | .35 | .146 | 18 | .27 | .012 | 31 | .25 | .191 |
| 2 | 604 | PA | 6 | .28 | .075 | 19 | .16 | .000 | 32 | .34 | .261 |
| 2 | 604 | NA | 7 | .24 | .133 | 20 | .25 | .119 | 33 | .40 | .032 |
| 3 (CS) | 299 | WE | 8 | .51 | .090 | 21 | .45 | .127 | 34 | .31 | .314 |
| 3 (CS) | 299 | CY | 9 | .51 | .118 | 22 | .51 | .177 | 35 | .37 | .007 |
| 3 (CS) | 299 | SC | 10 | .28 | .130 | 23 | .37 | .204 | 36 | .22 | .024 |
| 3 (LO) | 167 | WE | 11 | .43 | .054 | 24 | .39 | .126 | 37 | .23 | .087 |
| 3 (LO) | 167 | CY | 12 | .44 | .217 | 25 | .42 | .263 | 38 | .24 | .065 |
| 3 (LO) | 167 | SC | 13 | .33 | .192 | 26 | .39 | .134 | 39 | .23 | .087 |

Note: CS = cross-sectional; LO = longitudinal (associations between initial AS, AF, and CF and outcomes measured 6 months later); WE = work engagement; EWB = eudaimonic wellbeing; WS = work stress (reversed); LS = life satisfaction; PA = positive affect; NA = negative affect (reversed); CY = cynicism (reversed); SC = somatic complaints (reversed); AS = autonomy satisfaction; AF = autonomy frustration (reversed); CF = competence frustration (reversed); $r_{xy}$ = Pearson correlation between X and Y; $d$ = necessity effect (CE-FDH) of X on Y.

## Results

The range of spuriousness, i.e., effect expected due to the correlation between the variables, for the 39 necessity effects in Table 1 are presented in Fig 2. With one exception (effect #34), effects reported by Olafsen and Marescaux (2025) fell within or below the range of spuriousness, meaning that they were not significantly stronger than could be expected simply due to the correlation between the variables.

## Discussion

The present study set out to scrutinize findings and conclusions by Olafsen and Marescaux (2025), who claimed to have shown that satisfaction of basic psychological needs, and lack of frustration of those needs, are necessary conditions for employee wellbeing. Here, we show that necessity effects reported by Olafsen and Marescaux may have been spurious consequences of correlations between need satisfaction/frustration and wellbeing which, in turn, may have been spurious consequences of confounding effects by some common cause of self-rated need satisfaction/frustration and wellbeing, e.g., general positivity or negativity. Hence, the findings by Olafsen and Marescaux do not prove the presence of true necessity effects and their conclusions in this regard appear premature.

It is important for researchers using the NCA to be aware that it is susceptible to spurious findings in order not to overinterpret findings, something that appears to have happened to Olafsen and Marescaux. Similarly as in the present case, necessity effects in the NCA can often be accounted for by correlations between the variables (Sorjonen et al. 2025; Sorjonen and Melin 2025), meaning that necessity effects in the NCA do not prove necessity or causality any more than zero-order correlations do, i.e., not at all. In order to add some much-needed rigor to analyses, we recommend researchers using the NCA to estimate, as we did here, ranges of spuriousness. The "NCArigour" function available in our analytic script (https://osf.io/htc6e/) can be used to accomplish this. If estimated necessity effects fall within or below this range, they are not significantly stronger than could be expected simply due to the correlation between the variables and conclusions of necessity should probably be suspended.

### *Limitations*

The present findings do not prove, once and for all, that satisfaction and/or lack of frustration of basic psychological needs are not necessary for employee wellbeing. The more limited conclusion to be drawn is that findings by Olafsen and Marescaux may have been spurious and that they, therefore, did not prove that satisfaction and/or lack of frustration of basic psychological needs are necessary for employee wellbeing. Expressed differently, we have not proven the null hypothesis of no necessity effect to be correct, we have just shown that the null hypothesis has not been proven to be false.

Instruments used to collect the data analyzed by Olafsen and Marescaux, and simulated and reanalyzed by us, may not have been optimal. However, this speaks, in our opinion, for retaining the null hypothesis of no necessity effect rather than for rejecting it. We do not believe that it would be tenable to argue that due to potentially non-optimal measurements, we should reject the null hypothesis

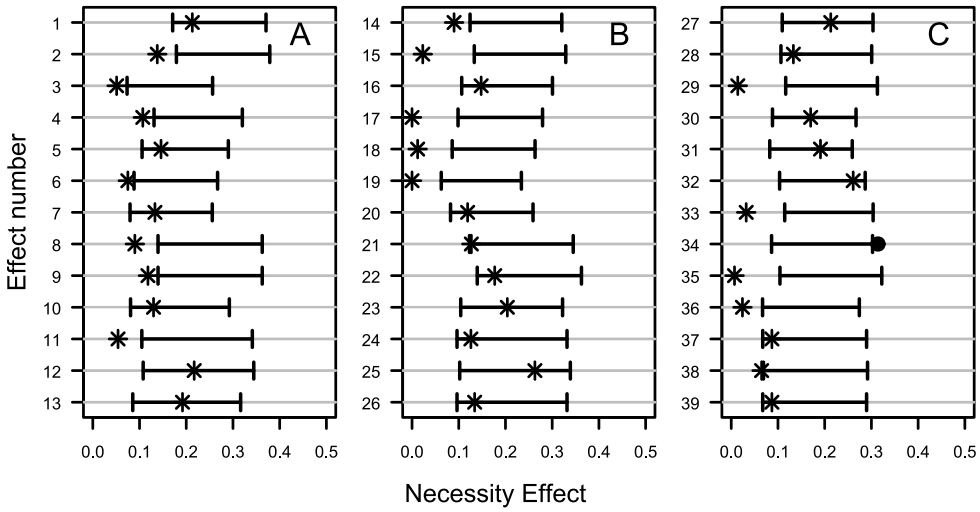


Fig 2. Necessity effects (CE-FDH) of autonomy satisfaction (A), low autonomy frustration (B), and low competence frustration (C) reported by Olafsen and Marescaux (the markers), as well as ranges of spuriousness estimated by us (the whiskers). Effect numbers correspond to effect numbers in Table 1. Solid marker = the effect is above the range of spuriousness; snowflake = the effect is within or below the range.

and assume the presence of true necessity effects of need satisfaction/frustration on employee wellbeing.

The data analyzed by Olafsen and Marescaux, and simulated and reanalyzed by us, were collected in three western countries (Norway, the UK, and the USA). It remains an open question whether or not the present main finding, that necessity effects of basic need satisfaction/frustration on employee wellbeing appeared to be spurious, generalizes to other cultural, social, and economic contexts.

*Conclusions*

Olafsen and Marescaux (2025) conducted analyses with the necessary condition analysis (NCA) and concluded that both satisfaction and low frustration of autonomy and low frustration of competence constitute necessities for employee wellbeing. However, here we show that the necessity effects reported by Olafsen and Marescaux were not significantly stronger than could be expected due to correlations between variables, meaning that these necessity effects may have been spurious. It is important for researchers using the NCA to be aware of its susceptibility to spurious findings in order not to overinterpret findings, something that appears to have happened to Olafsen and Marescaux. We recommend researchers using the NCA to scrutinize their findings by estimating ranges of spuriousness, i.e., effects that could be expected due to the correlation between variables. If the estimated necessity effect does not fall above the range of spuriousness, conclusions of necessity should probably be suspended.

## References


Dul, J. (2016). Necessary Condition Analysis (NCA): Logic and methodology of "necessary but not sufficient" causality. *Organizational Research Methods*, *19*(1), 10–52. https://doi.org/10.2139/ssrn.2588480

Dul, J. (2021). NCA: Necessary Condition Analysis. R package version 3.1.1. https://CRAN.R-project.org/package=NCA.

Dul, J., van der Laan, E., & Kuik, R. (2020). A statistical significance test for Necessary Condition Analysis. *Organizational Research Methods*, *23*(2), 385–395. https://doi.org/10.1177/1094428118795272

Kropko, J., & Harden, J. J. (2020). coxed: Duration-based quantities of interest for the Cox Proportional Hazards Model. R package version 0.3.3, https://CRAN.R-project.or/package=coxed.

Niemiec, C. P., Olafsen, A. H., Halvari, H., & Williams, G. C. (2022). Losing sleep over work: A self-determination theory view on need frustration, sleep disturbance, and mental ill health. *Stress and Health*, *38*(4), 790–803. https://doi.org/10.1002/smi.3134

Olafsen, A. H., & Marescaux, B. P. C. (2025). The bare necessities: a necessary condition analysis of the dual role of basic psychological need satisfaction and frustration on wellbeing at work. *Motivation and Emotion*, 1–21. https://doi.org/10.1007/s11031-025-10113-5

Olafsen, A. H., Niemiec, C. P., Halvari, H., Deci, E. L., & Williams, G. C. (2017). On the dark side of work: a longitudinal analysis using self-determination theory. *European Journal of Work and Organizational Psychology*, *26*(2), 275–285. https://doi.org/10.1080/1359432X.2016.1257611

R Core Team. (2025). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: basic psychological needs in motivation, development, and wellness* (Paperback edition.). New York London: The Guilford Press.

Slemp, G. R., Kern, M. L., Patrick, K. J., & Ryan, R. M. (2018). Leader autonomy support in the workplace: A meta-analytic review. *Motivation and Emotion*, *42*(5), 706–724. https://doi.org/10.1007/s11031-018-9698-y

Sorjonen, K., & Melin, B. (2025, April 4). Adding some rigor to Necessary Condition Analysis. OSF. https://doi.org/10.31234/osf.io/sq3b9_v1

Sorjonen, K., Melin, B., & Melin, M. (2025, June 29). Questionable necessity effects of basic psychological needs at work: A comment on Ding and Kuvaas (2025). PsyArXiv. https://doi.org/10.31234/osf.io/wneu2_v1

Trépanier, S.-G., Fernet, C., & Austin, S. (2016). Longitudinal relationships between workplace bullying, basic psychological needs, and employee functioning: a simultaneous investigation of psychological need satisfaction and frustration. *European Journal of Work and Organizational Psychology*, *25*(5), 690–706. https://doi.org/10.1080/1359432X.2015.1132200

Van den Broeck, A., Ferris, D. L., Chang, C.-H., & Rosen, C. C. (2016). A review of self-determination theory's basic psychological needs at work. *Journal of Management*, *42*(5), 1195–1229. https://doi.org/10.1177/0149206316632058

Venables, W. N., & Ripley, B. D. (2002). *Modern Applied Statistics with S*. New York, NY: Springer New York. https://doi.org/10.1007/978-0-387-21706-2