Reviewer #1: Review of the manuscript titled, "Is self-determination good for your effectiveness? A study of factors which influence performance within self-determination theory" (manuscript id: MOEM-D-20-00421).

In this research, the authors investigate through two experimental studies, to what extent need support and provision of incentives result in better performance and whether intrinsic motivation and positive affect as well as needs satisfaction mediate the effects of needs support (Study 1) or the effects of needs support along with rewards (Study 2) on performance. The authors found in Study 1 that competence support resulted in better performance and that intrinsic motivation and well-being mediated its impact on performance, whereas relatedness support was weaker predictor of performance. These finding were complemented in Study 2 where it was found that need satisfaction but not rewards predicted better performance and that competence need satisfaction mediated the latter relation. The study is dealing with an interesting research question, but there seem to exist several issues which tempered my initial enthusiasm and which prevent me from recommending the paper for

publication to MOEM in its current form.

The first major issue has to do with the potential contribution of the paper. The authors argue in several places throughout their manuscript that we know only little about how needs and incentives may work in tandem to predict performance is underdeveloped by citing the work of Cerasoli et al. (2016). I noticed that a similar argument was made by Cerasoli et al., though they questioned "whether the provision of incentives actually does erode need satisfaction outside laboratory contexts". Aside my objection about that issue (see below), I am not sure that the authors in the present research have ever examined that issue in a non-laboratory setting. But even so, I think that in their previous meta-analysis Deci, Koestner and Ryan (1999) did address (at least, partly) that issue because they showed which types of rewards (task-related rewards, performance-contingent rewards, unexpected rewards, symbolic rewards etc.) may alter the effects of incentives on performance.

Second, I doubt that Study 1 did address the main and interactive effects of incentives as this factor was held constant. The authors argue that the rewards (i.e., rewards, not incentives) that their participants received were salient and that "even with the presence of external incentives, the basic psychological needs impact performance". But we cannot know what would have been the impact if incentives were absent (this issue is only addressed in Study 2).

Moreover, I am wondering to what extent the allegedly manipulation of relatedness support (i.e., whether the experimenter "could use the folded origami for a workshop he was holding with children on another day") did indeed enhanced relatedness satisfaction. An inherent problem with that need manipulation (but partly also for the other two needs) was that there was no manipulation check.

Further, I am skeptical about whether the authors did assess task performance in Study 1. To me it seems more than a commitment or persistence, rather than performance. As such, the results from Study 1 cannot easily considered as a preliminary step of Study 2 in which performance was indeed assessed.

Also, I am a little bit puzzled about how the authors operationally defined and assessed subjective challenge (Figure1). On page 11, they refer to subjective difficulty which was assessed through three items. How this construct was evaluated? To me the item "How difficult will the task of folding origami be for you?" seems to capture perceived difficulty, not perceived challenge. The two constructs seem to be equated but I don't think that they should be treated as equivalent. A task could be easy but not challenging, and vice versa.

The second question that refers to chances seems to capture the idea of expectancy for success. In my naïve understanding challenge will be reflected by (a) moderate-to-high score in difficulty, (b) moderate-to-low chances of success, and (c) high effort. But I am not sure how the authors have calculated the scores from the three questions.

Regarding Study 2, I have some additional concerns. Namely, (a) the rewards were contingent-performance and as such it comes as no surprise (to me) that incentives did not undermine performance and/ or that there was no interaction effect.

Finally, I could have comment more extensively on the mediating effects had I been aware of the correlations among these variables. It is very likely that the mediating paths may subject to collinearity effects and as such may not be trustworthy. My best guess is that autonomy, competence, and relatedness (which should be treated as a manipulation check) along with intrinsic motivation are substantially correlated. So, many of the key arguments being made about the role of these needs and intrinsic motivation are doubtful.

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Reviewer #2: This paper examines the role of need satisfaction with or without the presence of tangible rewards. I found it difficult to read this paper because of the clarity of the writing, and some of my comments reflect this. Overall, I had some issues with the conceptualization of the "problem", the coverage of the literature review, the logic behind the hypothesized model, the design of the studies, and the alignment between these different elements. I am sorry to be so negative in my review but I hope that the information I provide below will help the authors in their future research.

1. I struggled with things like the opening sentence, which was unclear as to whether the authors actually asked people what would make them work, etc. and how they asked them. At its base, this sentence is also leading, because if you ask people "what would make them" do something, there's an inherent bias that motivation is external (so it's not surprising people would talk about things like rewards). In SDT, we typically ask people "why" they do something, which is free of this bias. There has actually been research asking people why they do something in a more qualitative way (asking them to list 3 reasons for doing something) which have been coded into whether reasons were intrinsic or extrinsic, and people are pretty equally distributed on that question. So whether the opening sentence was from actual research the authors did or meant to me a general statement, it's inaccurate.

2. I do not agree that the link between need satisfaction and performance has not attracted attention from researchers (p. 3 of the PDF, there are no page numbers in the manuscript). Van den Broeck et al.'s (2016) meta-analysis of work-related need satisfaction published in the Journal of Management reports over 50 studies that have examined links between need satisfaction and task performance, creativity, proactivity, OCB and work effort.

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.

3. There are many inaccuracies, such as saying that SDT does not state that people vary in how they "possess" the needs (in fact SDT does not say that but says that individual differences in needs are taken into account by asking individuals to report on their satisfaction, given that "actual need" versus "obtained" amounts to measuring its satisfaction), and saying that "there are other different reasons why [the needs] can predict performance, rather than an increase in internal motivation", which I fail to understand. Does it mean there are other mediators, besides motivation, that explain the relation between needs and performance? Autonomous motivation is not defined accurately on p. 6. The authors used a definition for intrinsic motivation. Autonomous motivation is the term used to talk about two types of motivation: intrinsic and identified.

4. The authors seem to put rewards 'besides' needs in their conceptual model. But needs are simply psychological mechanism that explain the impact of contextual factors on motivation, performance and well-being. So need satisfaction can be affected by rewards (a contextual factor), they are not independent of them. To me, this makes the whole logic of this paper wrong. I only understood when I read the studies that it's about need support, not need satisfaction. This is very different and relevant research should be reviewed for it. There is a lot of research on contextual factors that influence the three needs both in the experimental, educational, sport and work domains. There are also meta-analyses and a systematic review by Gavin Slemp et al., 2018, 2020, 2021 on teacher styles, leader autonomy support, and interventions to support the three needs in organizations.

5. The three "incompatible conclusions" are not incompatible. Rewards influence motivation through need satisfaction. What type of motivation is the interesting question: they might increase extrinsic motivation and could decrease intrinsic motivation IF they increase feelings of competence and decrease feelings of autonomy (and also possibly relatedness if they are individual rewards that hurt cooperation). I say "might" and "could" because it depends on many aspects of the reward as well: the strength of its instrumentality, its size, whether it's expected (ex-ante), tangible (not verbal), etc. In addition, when we say it affects performance, performance on what? Simple or complex task? Quantity or quality of performance? All these things actually matter if one digs through the literature a bit. But the point is, this is what the empiricial literature shows: incentives might boost some types of performance especially on simple tasks, and mainly through extrinsic

motivation. Intrinsic motivation boosts some types of performance, mainly qualitative/creative and mainly for complex tasks. Incentives, depending on their characteristics, can decrease intrinsic motivation.

Bailey, C. D., & Fessler, N. J. (2011). The moderating effects of task complexity and task attractiveness on the impact of monetary incentives in repeated tasks. Journal of Management Accounting Research, 23, 189-210

Byron, K., & Khazanchi, S. (2012). Rewards and creative performance: A meta-analytic test of theoretically derived hypotheses. Psychological Bulletin, 138, 809-830.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. Psychological Bulletin, 125.

Gagné, M., & Forest, J. (2008). The study of compensation systems through the lens of self-determination theory: Reconciling 35 years of debate. Canadian Psychology-Psychologie Canadienne, 49(3), 225-232.

Gerhart, B. (2017). Incentives and pay for performance in the workplace. In Advances in motivation science. (pp. 91-140). Elsevier Academic Press.

Jenkins, D. G., Jr., Mitra, A., Gupta, N., & Shaw, J. D. (1998). Are financial incentives related to performance? A meta-analytic review of empirical research. Journal of Applied Psychology, 83, 777-787.

Kuvaas, B., Buch, R., & Dysvik, A. (2020). Individual variable pay for performance, controlling effects, and intrinsic motivation. Motivation and Emotion, 44, 525-533.

Nordgren-Selar, A., Falkenberg, H., Hellgren, J., Gagné, M., & Sverke, M. (2020). It's [not] all 'bout the money: The relative importance of performance-based pay and support for psychological needs for job performance. Scandinavian Journal of Work and Organizational Psychology, 5(1), 1-14.

Thibault Landry, A., Forest, J., & Zigarmi, D. (2019). Revisiting the Use of Cash Rewards in the Workplace: Evidence of Their Differential Impact on Employees' Experiences in Three Samples Using Self-Determination Theory. Compensation & Benefits Review, 51, 92-111.

Thibault Landry, A., Forest, J., Zigarmi, D., Houson, D., & Boucher, É. (2017a). The Carrot or the Stick? Investigating the Functional Meaning of Cash Rewards and Their Motivational Power According to Self-Determination Theory. Compensation & Benefits Review, 49(1), 9-25.

Thibault Landry, A., Gagné, M., Forest, J., Guerrero, S., Séguin, M., & Papachristopoulos, K. (2017). The relation between financial incentives, motivation, and performance: An integrative SDT-based investigation. Journal of Personnel Psychology, 16, 61-76.

Weibel, A., Rost, K., & Osterloh, M. (2010). Pay for performance in the public sector—Benefits and (hidden) costs. Journal of Public Administration Research and Theory, 20(2), 387-412.

6. The authors cite a single meta-analysis on the effects of incentives on performance. There are many and they do not all lead to the same conclusions. When examining closely what each of the metas show, incentives boost quantitative (only) performance mostly on simple tasks. The authors ought to look at the tasks that were included in these meta-analyses. The early ones were jobs that for the most part no longer exist because of technology replacing them. I think it would be important to give credit to these other meta-analyses that have come up with slightly different conclusions from the Garbers and Conrad one.

Guzzo, R. A., Jette, R. D., & Katzell, R. A. (1985). The effects of psychologically based intervention programs on worker productivity: A meta-analysis. Personnel Psychology, 38, 275-291.

Jenkins, D. G., Jr., Mitra, A., Gupta, N., & Shaw, J. D. (1998). Are financial incentives related to performance? A meta-analytic review of empirical research. Journal of Applied Psychology, 83, 777-787.

Locke, E. A., Feren, D. B., McCaleb, V.M., Shaw, K. N., & Denny, A. T. (1980). The relative effectiveness of four methods of motivating employee performance. In K. D. Duncan, M. M. Gruenberg, & D. Wallis (Eds.), Changes in working life (pp. 363-388). Wiley.

Weibel, A., Rost, K., & Osterloh, M. (2010). Pay for performance in the public sector—Benefits and (hidden) costs. Journal of Public Administration Research and Theory, 20(2), 387-412.

7. The goal of each study relative to the "problem" identified through the literature review is not clear to me. Why is there no "no reward" condition or a "non-contingent reward" condition in Study 1? Wouldn't you need a control group in that study to ascertain the role of contingent rewards in determining the effect of the other manipulations? Otherwise what hypothesis does it answer than hasn't been answered already? Moreover, the literature review focused on need satisfaction and not on support for the needs, which can take many forms (teaching or managerial styles of interactions, motivating work design, etc. A recent study in an organizational setting actually looked at a design that seems to be what the authors here have in mind with quite interesting results that support SDT.

Vallerand, R. J., & Reid, G. (1984). On the causal effects of perceived competence on intrinsic motivation: A test of cognitive evaluation theory. Journal of Sport Psychology, 6(1), 94-102.

Ryan, R. M., Mims, V., & Koestner, R. (1983). Relation of reward contingency and interpersonal context to intrinsic motivation: A review and test using cognitive evaluation theory. Journal of Personality and Social Psychology, 45(4), 736-750.

Nordgren-Selar, A., Falkenberg, H., Hellgren, J., Gagné, M., & Sverke, M. (2020). It's [not] all 'bout the money: The relative importance of performance-based pay and support for psychological needs for job performance. Scandinavian Journal of Work and Organizational Psychology, 5(1), 1-14.

8. The measure of performance in both studies is quite crude: basically just the number of folded origami figures and number of words. So this is a quantity of performance measure? Does it control for quality (errors made or overall "folding" quality, length of word)? Given my comment #6, this is a relevant issue.

9. How is the manipulation of relatedness a manipulation of relatedness in Study 1? Is it meant to increase task significance? Were there manipulation checks, such as feelings of competence or relatedness? It seems quite "mild" a manipulation compared to what Adam Grant has done is his experiments on task significant (beneficiary contact), in which employees (thus paid) were assigned to different conditions (so I think Study 1 in terms of relatedness has already been done before but in a more externally valid environment). Also, what would be the rationale for this manipulation increasing intrinsic motivation? I could see it increasing identified regulation or prosocial motivation (task importance, meaning), but not enjoyment and interest.

10. Overall, I do not really know what Study 1 shows that helps us understand the effects of rewards on performance. What I can see is that when people get paid (but we don't know how it compares to people not getting paid, or paid non-contingently), support for competence and relatedness influences performance. There is nothing new about this as the Van den Broeck et al. (2016) meta-analysis has also shown that the satisfaction of these needs at work influence performance (therefore, this was in studies of paid employees).

11. I do not understand Tables 1 and 2. I personally think it would have been easier to understand if it was a 2X2 table with row being competence (high/low) and column being relatedness (high/low) or row being incentives (yes/no) and column being need support (yes/no). I also found the report of the results a little bit unusual. Usually if there is an interaction effect, the 2X2 table would provide all the means necessary to interpret the results. But now the means reported in Table 1 do not match what is reported in the text.

12. Study 2 comes closer to a study that aligns with the stated problem. Again, the Nordgren Selar study mentioned earlier essentially did the same in a real organizational context (less artificial, though predictors were not manipulated). The procedure is not completely clear. How many participants were in a session? There might be some issues with them supporting or thwarting each other's needs during the session that could not be controlled for (potential confound)?

13. The nature of the reward in Study 2 differs from the one in Study 1. Study 1 was a piece-rate low risk system, whereas it is more in the form of a performance bonus (higher-risk as need to reach a quota to get it). How was "performed well" determined and did all participants reach the target performance? Were they told what the performance target was? Was it determined to be optimally challenging as a performance target not to discourage people? According to expectancy theory as well as justice views of performance management and compensation, these have to be clear and well communicated in order for the reward to have its motivational effect. There has been research showing differences between these forms of rewards and their effects on needs, motivation, performance, and stress levels. The results for the incentive condition are in line with this thinking.

14. The needs manipulations seem adequate but were they verified with manipulation checks for autonomy, competence and relatedness satisfaction? But in this study, what would muddle the results for this is that in SDT it is assumed that need satisfaction would mediate BOTH manipulations (needs and incentives)…It's a bit unfortunate that this was not considered to fully understand the theory-driven psychological mechanisms (though in the results it seems to say need satisfaction was measured, it's not reported in the methods, and we don't know how they were measured).

15. I have never seen autonomy be negatively related to performance (figure 3). Is there a possibility of a suppression effect? What was the zero-order correlation between autonomy and performance? Also the three needs are often highly correlated, and given they were manipulated within the same condition, that could happen here. What was the correlation between the three measures? Finally, the model doesn't really make sense from an SDT point of view. Need satisfaction would mediate between support and intrinsic motivation. Here they are considered unrelated? I would be almost certain that intrinsic motivation is related to the three needs. Overall I think the mediation model is misspecified and for this reason I do not trust the interpretation of the results.