

Cross-lagged relations between delayed actions and the wandering mind

Article

Published Version

Creative Commons: Attribution 4.0 (CC-BY)

Open Access

Kum, Bertha H. C., Main, Eliza A. and Cheung, Rebecca Y. M. ORCID logo ORCID: <https://orcid.org/0000-0003-0998-7991> (2024) Cross-lagged relations between delayed actions and the wandering mind. *Personality and Individual Differences*, 217. 112448. ISSN 0191-8869 doi: <https://doi.org/10.1016/j.paid.2023.112448> Available at <https://centaur.reading.ac.uk/113597/>

It is advisable to refer to the publisher's version if you intend to cite from the work. See [Guidance on citing](#).

To link to this article DOI: <http://dx.doi.org/10.1016/j.paid.2023.112448>

Publisher: Elsevier

All outputs in CentAUR are protected by Intellectual Property Rights law, including copyright law. Copyright and IPR is retained by the creators or other copyright holders. Terms and conditions for use of this material are defined in the [End User Agreement](#).

www.reading.ac.uk/centaur

CentAUR

Central Archive at the University of Reading

Reading's research outputs online



Short Communication

Cross-lagged relations between delayed actions and the wandering mind

Bertha H.C. Kum^a, Eliza A. Main^b, Rebecca Y.M. Cheung^{b,*}^a Department of Early Childhood Education, The Education University of Hong Kong, 10 Lo Ping Road, Tai Po, Hong Kong^b School of Psychology and Clinical Language Sciences, University of Reading, Reading, RG6 6ES, United Kingdom

ARTICLE INFO

Keywords:

Procrastination
Mind wandering
Self-regulation
Cross-lagged relations

ABSTRACT

The present study investigated the longitudinal relationship between procrastination and mind wandering. A total of 196 Chinese adults participated in the study across three time points, spaced four months apart. Findings based on a cross-lagged panel model suggested that procrastination predicted mind wandering over time, but not the vice versa, thereby indicating the unidimensionality of effects from procrastination to mind wandering. Procrastination may be attributed to self-regulatory failure, resulting in off-task activities such as mind wandering. However, mind wandering does not necessarily lead to dilatory behaviors. The present findings provide insight to practitioners regarding the predictive effects of procrastination on mind wandering.

1. Introduction

As a tendency to delay intended activities voluntarily regardless of the expected negative consequence (Steel, 2007), procrastination affects approximately 20–25 % of adults (Ferrari et al., 2007). The prevalence of procrastination is concerning given its association with a wide array of outcomes, including greater psychological distress (Sirois & Pychyl, 2013), greater self-handicapping behavior (Beck et al., 2000), and a lower tendency to be mindful (Cheung & Ng, 2019). Indeed, procrastination and self-regulation are closely related (Sirois & Pychyl, 2013; Steel, 2007; Tice & Bratslavsky, 2000), as procrastination sometimes occurs when people prioritize mood regulation over long-term goals (Tice & Bratslavsky, 2000). By temporarily abandoning the task at hand, people can avoid negative mood associated with the task (Sirois & Pychyl, 2013), although they may sacrifice long-term achievements.

Self-regulatory failure serves as an explanatory mechanism for both procrastination and mind wandering (McVay & Kane, 2010; Tice & Bratslavsky, 2000). Mind wandering refers to people's engagement with self-generated and task-unrelated thoughts evoked by the external environment or internal mental cues, particularly when they shift their attention away from an ongoing task (Smallwood & Schooler, 2015). It is also regarded as an executive control failure, in which people fail to counter their interfering thoughts and inevitably draw their attention away (McVay & Kane, 2010). Self-determination theory (Deci & Ryan, 1985) highlighted autonomy as one of the motivational factors for people to achieve their goals of their choice (Legault & Inzlicht, 2013). When the goals at hand are not autonomously decided and arouse

negative mood, people may procrastinate (Sirois & Pychyl, 2013) and engage in other off-task activities, such as mind wandering. Previous research suggested that procrastination was associated with greater thought intrusions cross-sectionally (e.g., rumination and daydreaming, in which the mind was directed away from an ongoing task). The association was further mediated by a lack of perseverance, i.e., an ability to stay focused on a task regardless of the obstacles. As such, procrastination may give rise to mind wandering through processes such as perseverance. Despite the relevant findings, little has been done to examine the direct longitudinal association between procrastination and mind wandering.

Grounded in the literature (Rebetz et al., 2018), the present study hypothesized that procrastination would positively predict mind wandering in a cross-lagged panel analysis over three time points. As procrastination and mind wandering are both linked to self-regulation failure (McVay & Kane, 2010; Tice & Bratslavsky, 2000), we controlled for the potential effect of mind wandering on procrastination over time.

2. Method

2.1. Participants

Participants were 196 Chinese adults (85.71 % women) from Hong Kong recruited through online platforms and mass emails. Participants were aged between 18 and 48 years old, with a mean age of 25.03 years ($SD = 6.26$) at time 1 (T1). They completed the questionnaire three times every four months. The retention rate was 92.86 % ($n = 182$) at

* Corresponding author at: School of Psychology and Clinical Language Sciences, University of Reading, Reading, United Kingdom.

E-mail address: rebecca.cheung@reading.ac.uk (R.Y.M. Cheung).

time 2 (T2) and 93.41 % (n = 170) at time 3 (T3).

2.2. Measures

2.2.1. Procrastination

The 16-item Procrastination Scale (PS; Tuckman, 1991) was used to measure procrastination. This was a self-reported 4-point scale with a single-factor structure from 1 (that's not me for sure) to 4 (that's me for sure). Sample items included "I needlessly delay finishing jobs, even when they're important." The one-factor model of the measure yielded good fit to the data in a study involving a Chinese sample (Cheung & Ng, 2019). In this study, the intraclass correlation (ICC) for procrastination was 0.64, $p < .001$. Cronbach's alpha = 0.91 to 0.92 from T1 to T3.

2.2.2. Mind wandering

The 15-item Mind Excessively Wandering Scale (MEWS; Mowlem et al., 2019) was used to assess mind wandering. This was a self-reported measure with a single-factor structure on a 4-point scale ranging from 1 (not at all/rarely) to 4 (nearly all the time/constantly). Sample items included "I find it hard to switch my thoughts off." In the present study, the scale was translated into Chinese following the back-translation procedures (Brislin, 1970) to ensure clarity and accuracy. Confirmatory factor analysis of the MEWS at T1 with a one-factor model yielded adequate fit to the data, $\chi^2(84) = 192.14, p = .001, CFI = 0.92, TLI = 0.91, RMSEA = 0.08, SRMR = 0.05$. All of the factor loadings were significant at $ps < 0.001$. In this study, the ICC for mind wandering was 0.63, $p < .001$. Cronbach's alpha = 0.91 to 0.93 from T1 to T3.

2.3. Analytic plan

To infer the directionality of effects and reduce potential biases of stationarity and stability (Cole & Maxwell, 2003), a cross-lagged panel model between procrastination and mind wandering was conducted using MPLUS Version 8.8 (Muthén & Muthén, 1998–2022). Change in mind wandering and procrastination was incorporated by modeling the stability coefficients between time, respectively, i.e., T1 mind wandering was added to predict T2 mind wandering; T1 procrastination was added to predict T2 procrastination. Cross-lagged predictions were added between procrastination and mind wandering over time. For instance, T1 procrastination was added to predict T2 mind wandering, and vice versa. To examine the fit of the model to the observed matrices of variance and covariance, maximum likelihood method was utilized. Any missing data at the item and subscale levels were handled by full information maximum likelihood estimation. Given the moderate ICCs for procrastination and mind wandering indicated substantial between-person variance, a random intercept cross-lagged panel model (RI-CLPM) was further conducted (Hamaker et al., 2015). The MPLUS codes are documented in the Supplementary Materials.

3. Results

The means, standard deviations, and zero-order correlations are presented in the supplementary materials. The cross-lagged model fit the data adequately, $\chi^2(8) = 14.04, p = .008, CFI = 0.98, TLI = 0.95, RMSEA = 0.07, SRMR = 0.05$ (See Fig. 1). Table 1 shows the path coefficients between procrastination and mind wandering. Subsequent RI-CLPM yielded poor fit to the data, $\chi^2(1) = 4.83, p = .003, CFI = 0.99, TLI$

Table 1
Parameter estimates of the cross-lagged model.

Parameters	Unstandardized Estimates (SEs)	Standardized estimates
Hypothesized pathways		
T1 Mind wandering→T2 Procrastination	0.16(0.08)*	0.16*
T2 Mind wandering→T3 Procrastination	0.17(0.08)*	0.17*
T1 Procrastination→T2 Mind wandering	0.04(0.07)	0.04
T2 Procrastination→T3 Mind wandering	0.05(0.07)	0.06
Gender→T2 Mind wandering	-0.09(0.09)	-0.06
Gender→T2 Procrastination	0.09(0.09)	0.06
Gender→T3 Mind wandering	0.19(0.08)*	0.12*
Gender→T3 Procrastination	-0.07(0.09)	-0.05
Age→T2 Mind wandering	-0.00(0.01)	-0.03
Age→T2 Procrastination	-0.02(0.01)	-0.17*
Age→T3 Mind wandering	0.00(0.01)	0.03
Age→T3 Procrastination	-0.01(0.01)	-0.10
Employment status→T2 Mind wandering	-0.14(0.10)	-0.12
Employment status→T2 Procrastination	0.02(0.09)	0.02
Employment status→T3 Mind wandering	0.15(0.08)	0.12
Employment status→T3 Procrastination	0.16(0.09)	0.13
Autoregressive control		
T1→T2 Mind wandering	0.53(0.07)***	0.56***
T2→T3 Mind wandering	0.80(0.06)***	0.75***
T1→T2 Procrastination	0.58(0.06)***	0.57***
T2→T3 Procrastination	0.37(0.08)***	0.39***
Covariance		
T1 Mind wandering↔T1 Procrastination	0.10(0.03)***	0.30***
Error covariance		
T3 Mind wandering↔T3 Procrastination	0.03(0.01)**	0.20**
T1 Procrastination↔T3 Procrastination	0.10(0.03)***	0.40***

Note. Gender was indicated by 0 = men; 1 = women; employment status was indicated by 0 = university student; 1 = employed individual. * $p < .05$, ** $p < .01$, *** $p < .001$.

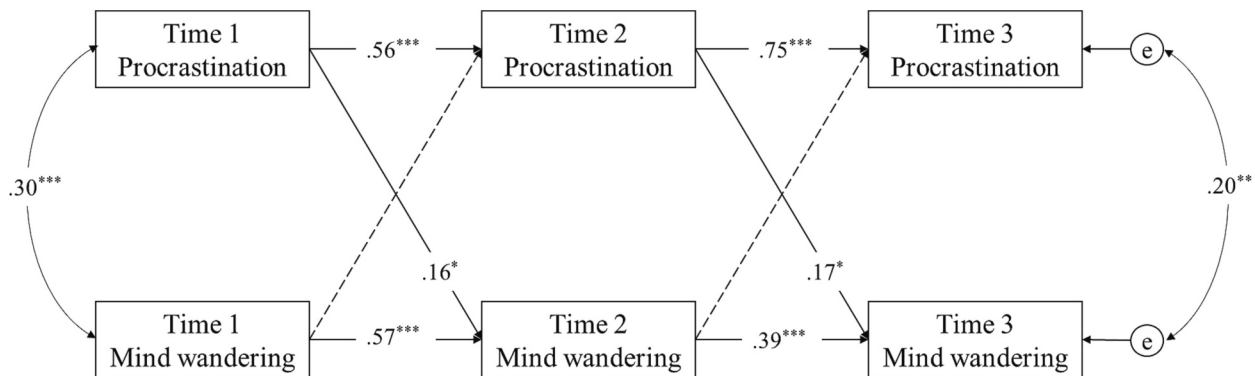


Fig. 1. Final model between procrastination and mind wandering, with gender, age, and employment status as covariates. $\chi^2(8) = 14.04, p = .008, CFI = 0.98, TLI = 0.95, RMSEA = 0.07$. Non-significant paths are depicted in dashed arrows for clarity. * $p < .05$, ** $p < .01$, *** $p < .001$.

= 0.86, RMSEA = 0.14, SRMR = 0.03.

4. Discussion

Guided by previous research on procrastination and self-regulation (Rebetez et al., 2018; Tice & Bratslavsky, 2000), the present study examined the relation between procrastination and mind wandering over three time points spaced four months apart. Consistent with existing findings (Rebetez et al., 2018), procrastination was found to be a longitudinal predictor of mind wandering. As a control variable, mind wandering did not predict procrastination over time. Additionally, the autoregressive effects of procrastination and mind wandering demonstrated stability, suggesting that these dispositions are unlikely to change in a few months' time. Taken together, the findings extended the literature by revealing the unidimensionality of longitudinal effects from procrastination to mind wandering.

The present study showed that procrastination consistently predicted mind wandering over time. The occurrence of procrastination may be attributed to self-regulation failure, when people delay their tasks at the expense of achieving important goals (Tice & Bratslavsky, 2000). For instance, people may focus on short-term mood regulation and lose their motivation to engage in the tasks at present (Grund & Fries, 2018; Ryan & Deci, 2000). Being reluctant to complete the task at hand, people's tendency to procrastinate may also result in poorer attention, thereby leading to off-task activities including mind wandering (McVay & Kane, 2010).

In this study, mind wandering was not predictive of procrastination over time. It is speculated that when the mind wanders off to past behaviors via rumination (Rebetez et al., 2018), negative self-evaluations, and automatic thoughts (Flett et al., 2016), people may not necessarily be trying to avoid or put off a task at hand. For instance, when the mind wanders off to future planning (Baird et al., 2011), people may still be indirectly engaging in task-relevant behaviors. As such, mind wandering may not always give rise to procrastination.

4.1. Limitations and further directions

Several limitations should be addressed in this study and considered by future research. First, the present study examined a general self-report of mind wandering. Future studies could apply other methods, such as observer-report (e.g., Neigel et al., 2019) or experimental tasks such as probe-caught sampling (Seli et al., 2013), to better evaluate mind wandering episodes and their relationships with procrastination behaviors. Moreover, as mind wandering may be perceived as intentional or unintentional (Seli et al., 2016), future studies may further disentangle the relations between intentional vs. unintentional mind wandering and procrastination. Next, the moderate ICCs for procrastination and mind wandering indicated substantial between-person variance. However, the RI-CLPM findings revealed poor fit to the data due, potentially, to model misspecification or our relatively small sample. Future studies should include a larger sample to ensure that the power is sufficient for complex data analyses. As another limitation, the lag between time points was short at four months apart, thereby contributing to the stability of the measures. Future studies may reduce the stability by lengthening the lag between time points. Finally, the relation between procrastination and mind wandering may be explained by third variables, such as motivation (Ryan & Deci, 2000), grit, and urgency (Rebetez et al., 2018). Future studies may include mediators and moderators to further understand the link between procrastination and mind wandering.

To conclude, this longitudinal study contributed to the literature by showing procrastination as a consistent predictor of mind wandering over time. Findings are noteworthy for researchers and practitioners in the understanding of procrastination as a precursor of mind wandering.

Ethics approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all participants included in the study.

Funding

This research was funded by Individual Research Fund, The Education University of Hong Kong (Funding code #R6538).

CRediT authorship contribution statement

Bertha H.C. Kum: Data curation, Writing – original draft. **Eliza A. Main:** Writing – original draft. **Rebecca Y.M. Cheung:** Conceptualization, Methodology, Investigation, Writing – original draft, Supervision, Project administration, Resources, Funding acquisition.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

Acknowledgments

This study was funded by The Education University of Hong Kong. We would like to thank the participants for their contribution to this research.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.paid.2023.112448>.

References

- Baird, B., Smallwood, J., & Schooler, J. W. (2011). Back to the future: Autobiographical planning and the functionality of mind-wandering. *Consciousness and Cognition*, 20(4), 1604–1611. <https://doi.org/10.1016/j.concog.2011.08.007>
- Beck, B. L., Koons, S. R., & Milgrim, D. L. (2000). Correlates and consequences of behavioral procrastination: The effects of academic procrastination, self-consciousness, self-esteem and self-handicapping. *Journal of Social Behavior and Personality*, 15(5), 3–13.
- Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology*, 1(3), 185–216. <https://doi.org/10.1177/135910457000100301>
- Cheung, R. Y. M., & Ng, M. C. Y. (2019). Being in the moment later? Cross-lagged relations between mindfulness and procrastination. *Personality and Individual Differences*, 141, 123–126. <https://doi.org/10.1016/j.paid.2018.12.015>
- Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: Questions and tips in the use of structural equation modeling. *Journal of Abnormal Psychology*, 112(4), 558–577. <https://doi.org/10.1037/0021-843X.112.4.558>
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Plenum Press.
- Ferrari, J. R., Diaz-Morales, J. F., O'Callaghan, J., Diaz, K., & Argumedo, D. (2007). Frequent behavioral delay tendencies by adults: International prevalence rates of chronic procrastination. *Journal of Cross-Cultural Psychology*, 38(4), 458–464. <https://doi.org/10.1177/0022022107302314>
- Flett, A. L., Haghbin, M., & Pychyl, T. A. (2016). Procrastination and depression from a cognitive perspective: An exploration of the associations among procrastinatory automatic thoughts, rumination, and mindfulness. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, 34, 169–186. <https://doi.org/10.1007/s10942-016-0235-1>

- Grund, A., & Fries, S. (2018). Understanding procrastination: A motivational approach. *Personality and Individual Differences, 121*, 120–130. <https://doi.org/10.1016/j.paid.2017.09.035>
- Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. (2015). A critique of the cross-lagged panel model. *Psychological Methods, 20*(1), 102–116. <https://doi.org/10.1037/a0038889>
- Legault, L., & Inzlicht, M. (2013). Self-determination, self-regulation, and the brain: Autonomy improves performance by enhancing neuroaffective responsiveness to self-regulation failure. *Journal of Personality and Social Psychology, 105*(1), 123. <https://doi.org/10.1037/a0030426>
- McVay, J. C., & Kane, M. J. (2010). Does mind wandering reflect executive function or executive failure? Comment on Smallwood and Schooler (2006) and Watkins (2008). *Psychological Bulletin, 136*(2), 188–197. <https://doi.org/10.1037/a0018298>
- Mowlem, F. D., Agnew-Blais, J., Pingault, J. B., & Asherson, P. (2019). Evaluating a scale of excessive mind wandering among males and females with and without attention-deficit/hyperactivity disorder from a population sample. *Scientific Reports, 9*(1), 1–9. <https://doi.org/10.1038/s41598-019-39227-w>
- Muthén, L. K., & Muthén, B. O. (1998-2022). *Mplus User's Guide* (8th ed.). Muthén & Muthén.
- Neigel, A. R., Claypoole, V. L., Fraulini, N. W., Waldfole, G. E., & Szalma, J. L. (2019). Where is my mind? Examining mind-wandering and vigilance performance. *Experimental Brain Research, 237*, 557–571. <https://doi.org/10.1007/s00221-018-5438-5>
- Rebetez, M. M. L., Rochat, L., Barsics, C., & Van der Linden, M. (2018). Procrastination as a self-regulation failure: The role of impulsivity and intrusive thoughts. *Psychological Reports, 121*(1), 26–41. <https://doi.org/10.1177/0033294117720695>
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*(1), 54–67. <https://doi.org/10.1006/ceps.1999.1020>
- Seli, P., Cheyne, J. A., & Smilek, D. (2013). Wandering minds and wavering rhythms: Linking mind wandering and behavioral variability. *Journal of Experimental Psychology: Human Perception and Performance, 39*(1), 1. <https://doi.org/10.1037/a0030954>
- Seli, P., Risko, E. F., Smilek, D., & Schacter, D. L. (2016). Mind-wandering with and without intention. *Trends in Cognitive Sciences, 20*(8), 605–617. <https://doi.org/10.1016/j.tics.2016.05.010>
- Sirois, F., & Pychyl, T. (2013). Procrastination and the priority of short-term mood regulation: Consequences for future self. *Social and Personality Psychology Compass, 7*(2), 115–127. <https://doi.org/10.1111/spc3.12011>
- Smallwood, J., & Schooler, J. W. (2015). The science of mind wandering: Empirically navigating the stream of consciousness. *Annual Review of Psychology, 487*–518. <https://doi.org/10.1146/annurev-psych-010814-015331>
- Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin, 133*(1), 65–94. <https://doi.org/10.1037/0033-2909.133.1.65>
- Tice, D. M., & Bratslavsky, E. (2000). Giving in to feel good: The place of emotion regulation in the context of general self-control. *Psychological Inquiry, 11*(3), 149–159. https://doi.org/10.1207/S15327965PLI1103_03
- Tuckman, B. W. (1991). The development and concurrent validity of the procrastination scale. *Educational and Psychological Measurement, 51*(2), 473–480.