Within-day time-varying associations between behavioral cognitions and physical activity in adults

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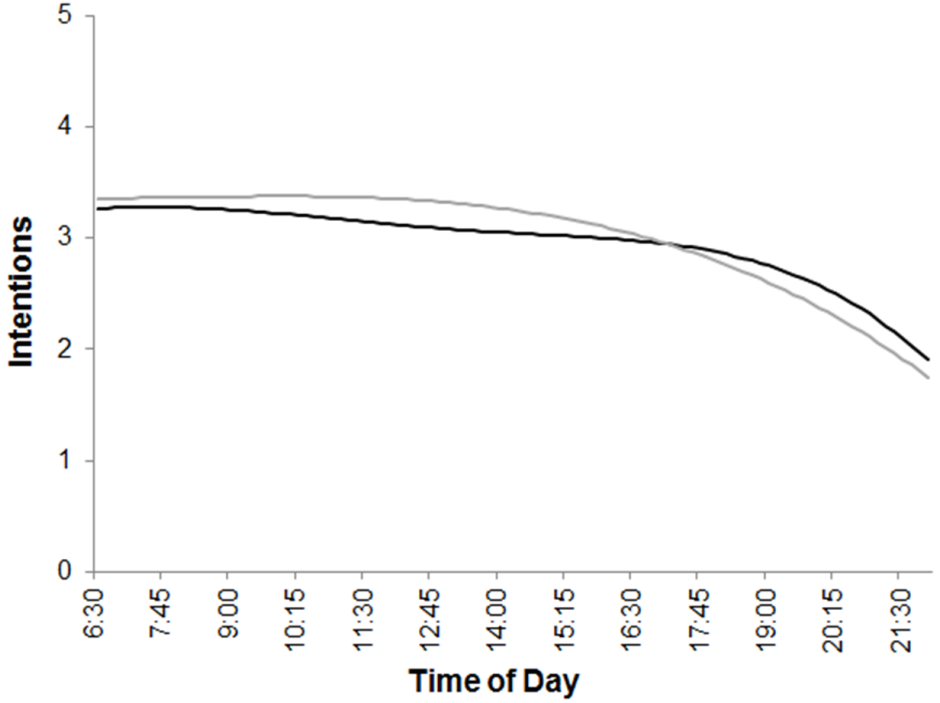
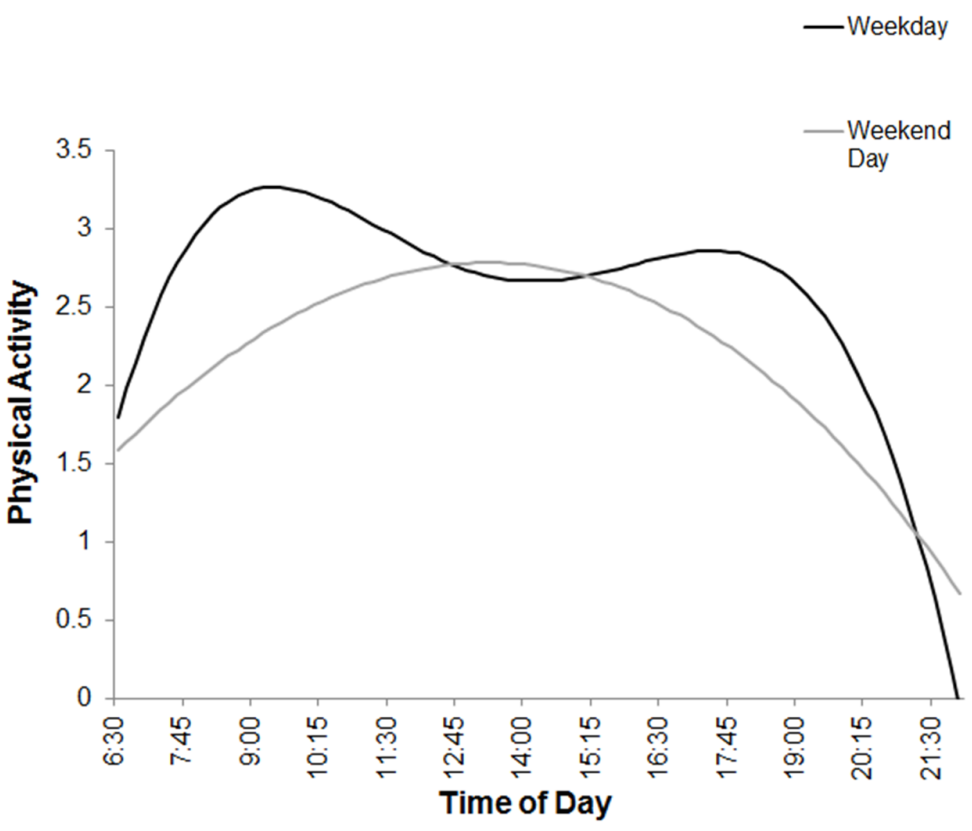




Associations between behavioral cognitions and physical activity largely investigated at the between-person level.

- EMA studies suggest that within-person changes in behavioral cognitions and physical activity are coupled
- A variety of contextual factors may impact our cognitions and behavior as well as associations between them over the course of the day
- Using time-varying effect models (TVEM) could enhance our understanding of the relations between physical activity and behavior cognitions

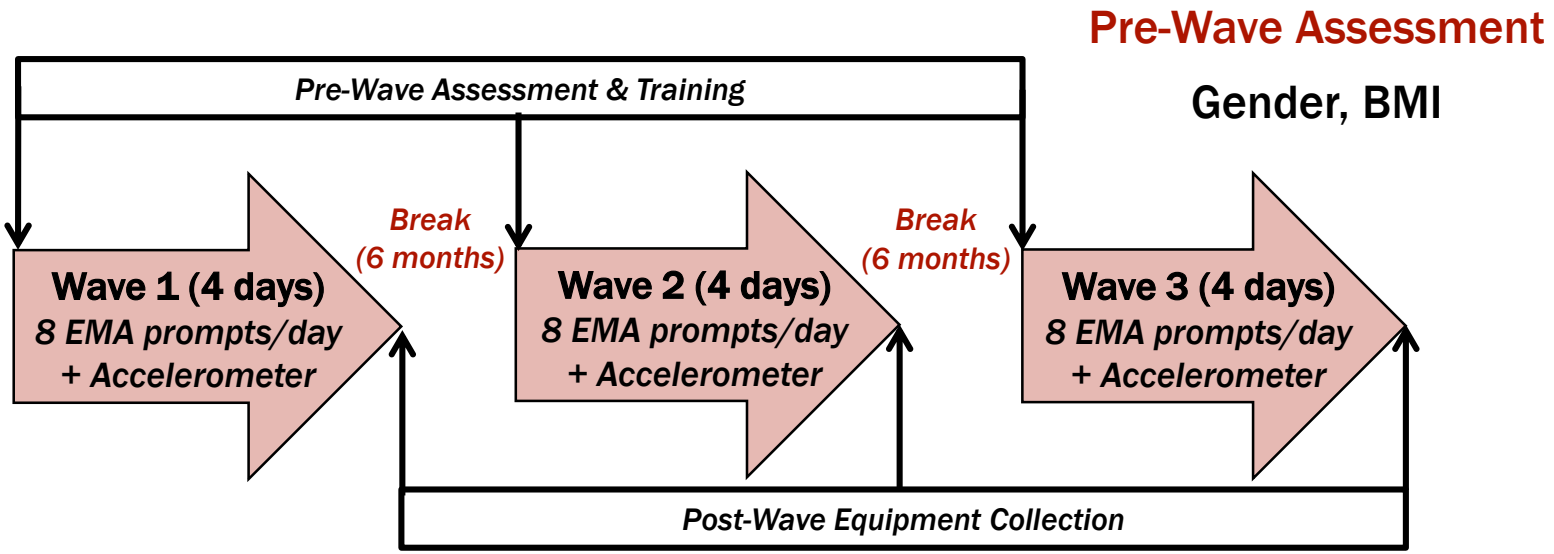
(Conroy, Elavsky, et al., 2013; Conroy et al., 2011; Pickering et al., 2015)

Objectives

1) Investigate within-day time-varying associations between momentary behavioral cognitions and subsequent change in physical activity

2) Examine weekday-weekend day differences in these associations

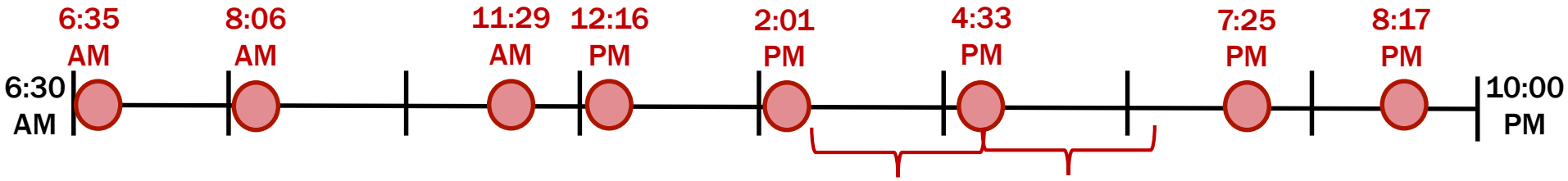
Project MOBILE: 3 waves of data collection with 4 days of EMA and objective physical activity within each wave.

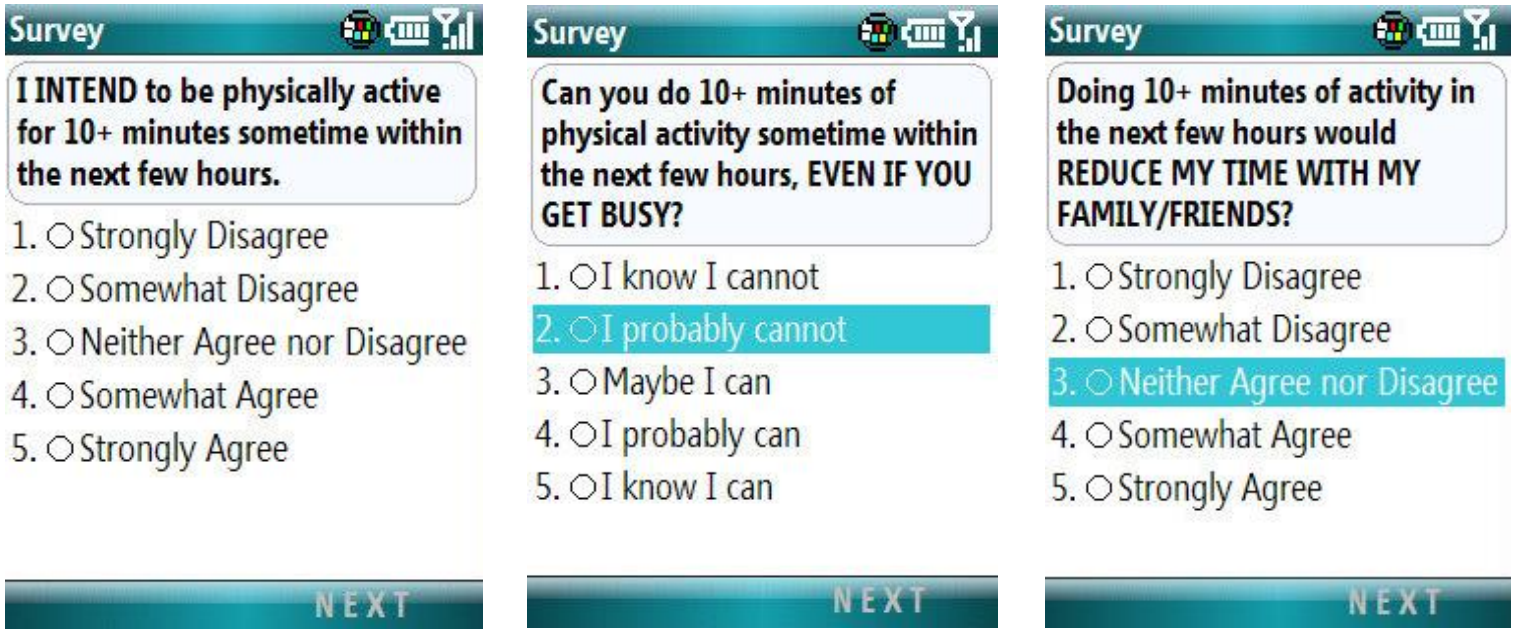


116 adults not meeting physical activity guidelines (M_{age} = 41 years, 73% female, 62% overweight/ obese)

(Dunton et al., 2012)

EMA assessed behavioral cognitions and accelerometers measured physical activity in the subsequent two hours.





Intentions | Self-Efficacy | Outcome Expectancies

TVEM is uniquely suited for analysis of time-stamped intensive longitudinal data collected through EMA.

1) Explicitly models changes in the association between covariates and an outcome

2) Does not impose any parametric assumptions

3) Accommodates unequal spacing of observations and unequal number of assessments across participants

(Shiyko, Lanza, Tan, Li, & Shiffman, 2012; Shiyko, Naab, Shiffman, & Li, 2014; Tan et al., 2012)

TVEM tested within-day time-varying associations between behavioral cognitions and subsequent change in physical activity.

$$\text{SubsequentPA}_{ij} = \beta_0(t) + \beta_1(t)*\text{Intentions}_{ij} + \beta_2(t)*\text{Weekend}_{ij} + \beta_3(t)*\text{Intentions}*\text{Weekend}_{ij} + \beta_4(t)*\text{PreviousPA}_{ij} + \beta_5*\text{Gender}_i + \beta_6*\text{BMI}_i + e_{ij}$$

(Shiyko, Lanza, Tan, Li, & Shiffman, 2012; Shiyko, Naab, Shiffman, & Li, 2014; Tan et al., 2012)

Model:

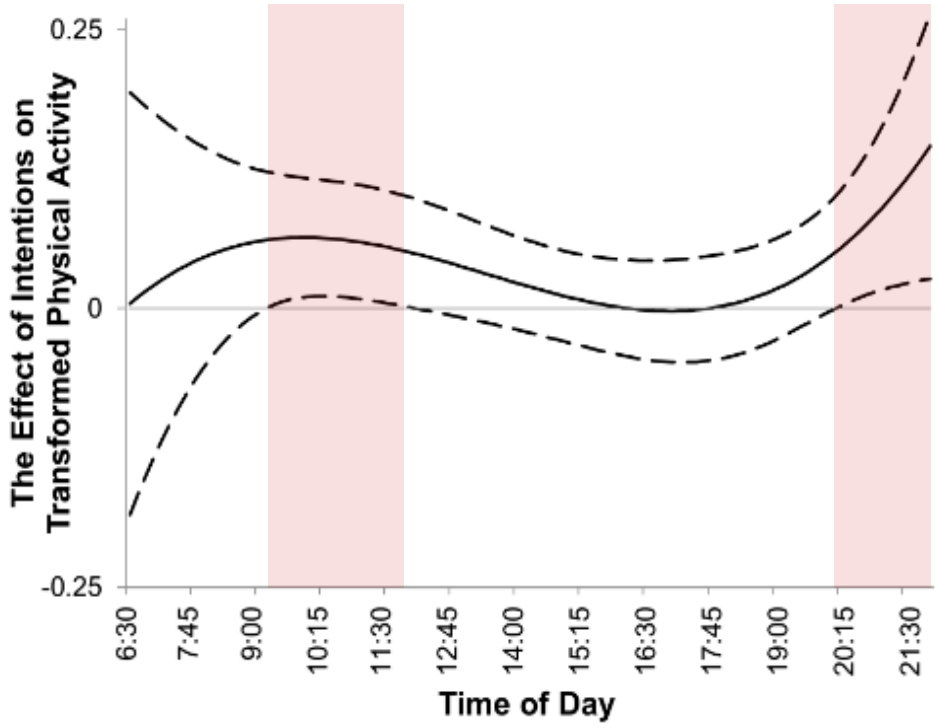
$$SubsequentPA_{ij} = \beta_0(t) + \beta_1(t)*Intentions_{ij} + \beta_2(t)*Weekend_{ij} + \beta_3(t)*Intentions*Weekend_{ij} + \beta_4(t)*PreviousPA_{ij} + \beta_5*Gender_i + \beta_6*BMI_i + e_{ij}$$

SAS Code:

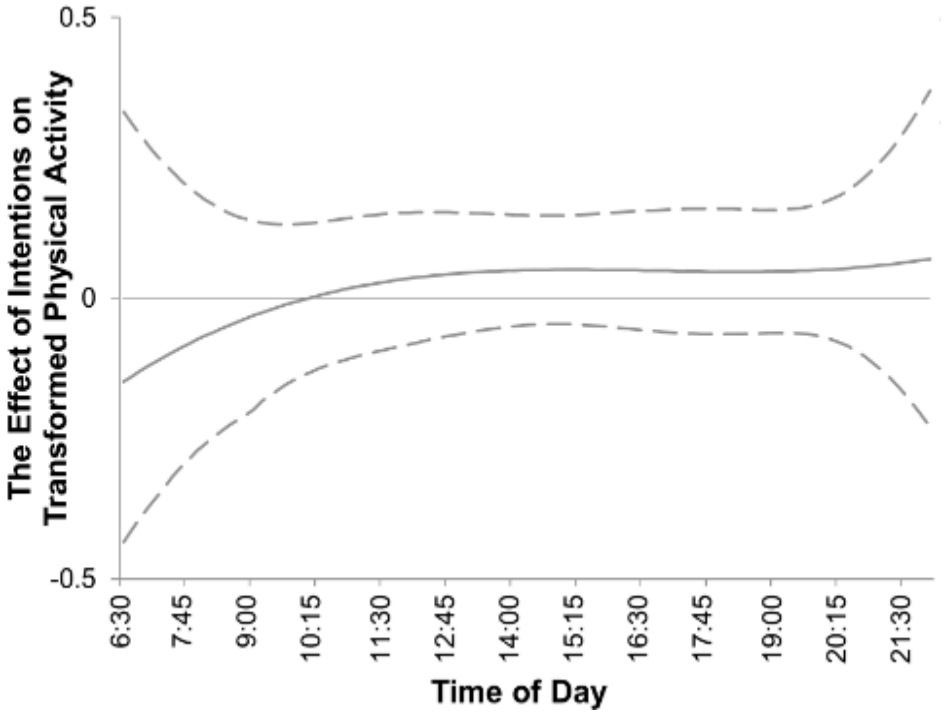
```
%TVEM_normal(
method = P-spline,
mydata = TVEM,
id = ID,
time = TimeOfDay,
dep = SubsequentPA,
class_var = Gender,
tcov = int Intentions Weekend IntentionsWeekend PreviousPA,
cov_knots = 6 6 6 6 6,
cov = Gender BMIC
);
```

TVEM macro suite and user guide available at: methodology.psu.edu

Intentions predicted change in physical activity in the morning (9:10am-11:55am) and in the evening (8:10pm-10:00pm) on weekdays, but at no time on weekend days.

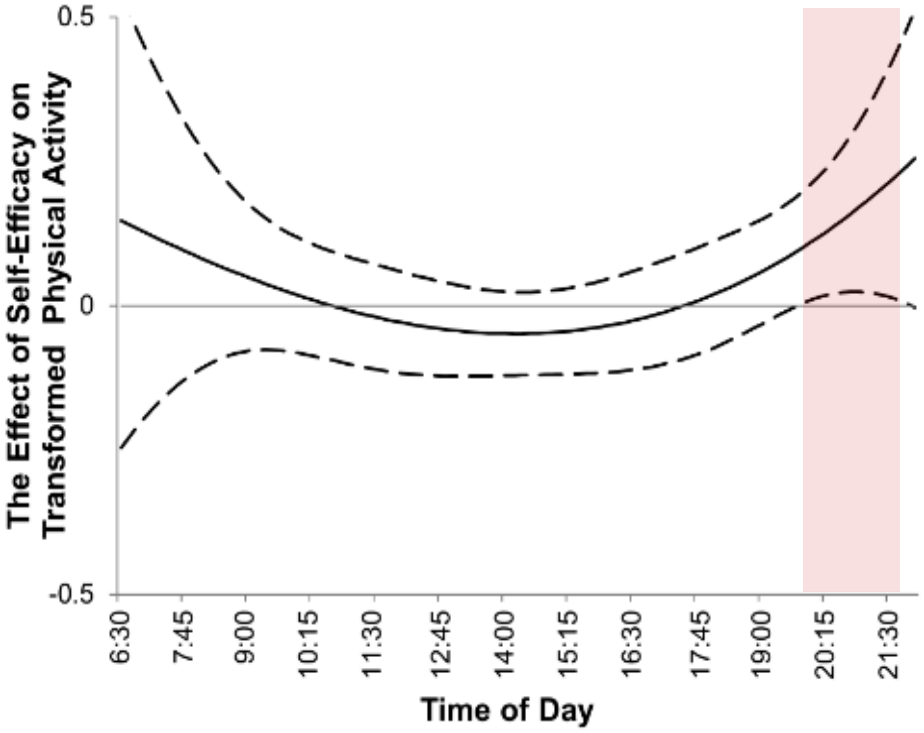


Weekdays

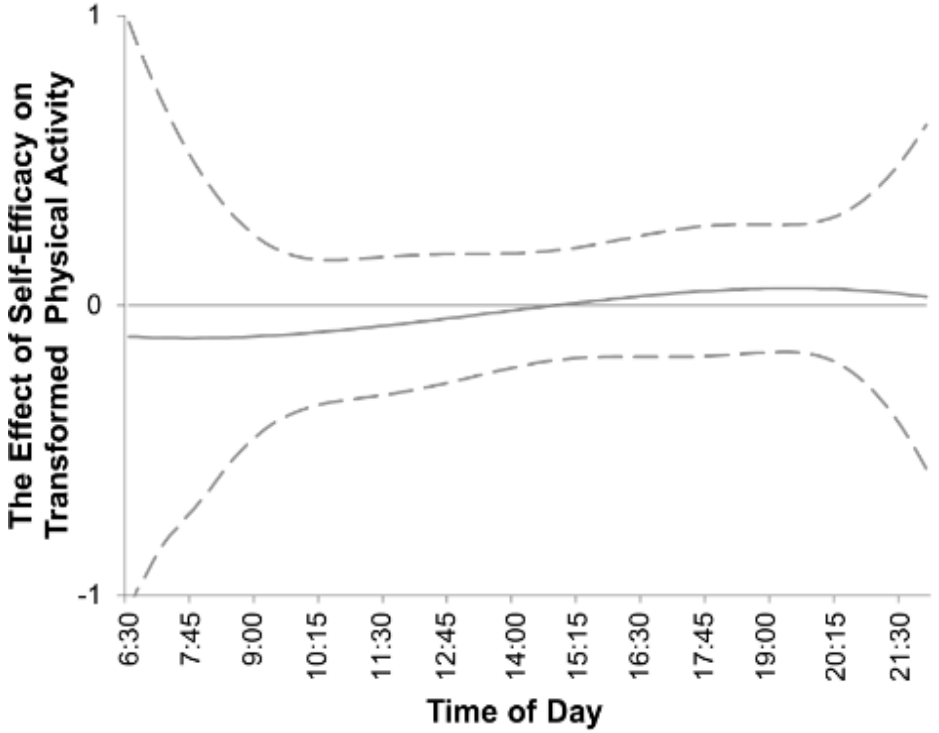


Weekend days

Self-efficacy predicted change in physical activity in the evening (7:45pm-9:45pm) on weekdays, but at no time on weekend days.

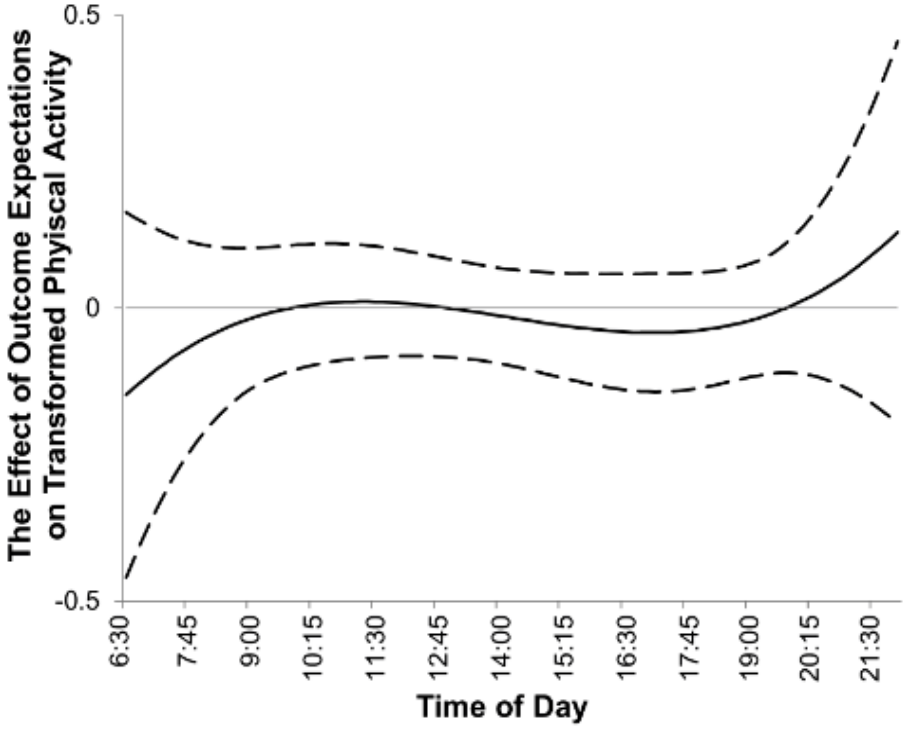


Weekdays

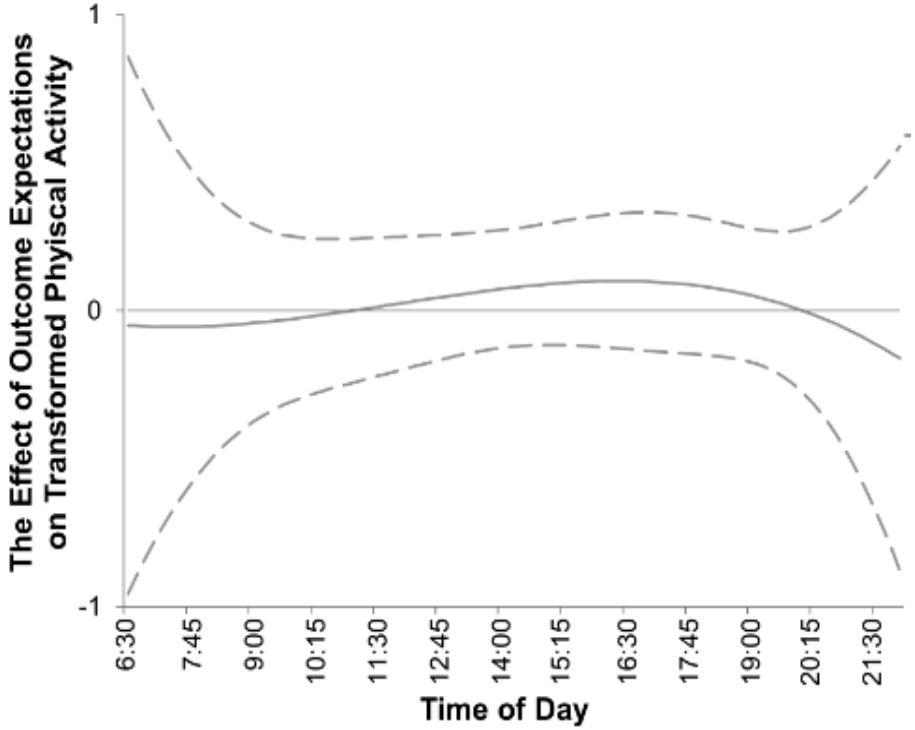


Weekend days

Outcome expectations were unrelated to change in physical activity on weekday and weekend days regardless of time of day.



Weekdays



Weekend days

Implications of major findings

- Results suggest temporal variation in associations between behavioral cognitions and subsequent physical activity on weekdays
- Identifies windows of opportunity and vulnerability for motivation-based physical activity interventions
- Theories of motivation need to be refined to incorporate time as a meaningful dimension of behavior

Thank you!

TVEM macro suite and user guide available at: methodology.psu.edu

Today's slides are available at: jaclynpmaher.com