Prospective and Ecological Momentary Testing of the Job-Demand-Control-Support Model in the Prediction of Teacher Stress*

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Outline

- Background
- Aims
- Method
- JDCS model testing using Ecological Momentary Assessment
- JDCS model predictions of teacher stress/affect daily and seasonal profiles
- Conclusions
Partial report on the 1\textsuperscript{st} year of a study funded by the Institute of Education Sciences in 2011 entitled 'Using Longitudinal and Momentary Analysis to Study the Impact of Middle School Teachers' Stress on Teacher Effectiveness, Student Behavior, and Achievement’

The overall aim is to explore the link between teacher stress and student behaviors and achievement, via teacher health/work outcomes and teacher effectiveness, over a period of three years.
Background

- Research worldwide has shown that teaching is a highly stressful occupation (Kyriacou, 2001; Pithers, 1995).

- Teacher stress has been linked to poor health (e.g., Betoret, 2006; van der Doef & Maes, 2002), absenteeism and turnover (Collie, Shapka & Perry, 2012; Klassen, Usher & Bong, 2010).

- Teacher stress may affect teacher effectiveness, productivity and subsequent student learning (Brouwers & Tomic, 2000; Dorman, 2003).

Need to address teacher stress as part of pursuing quality education.
Need validated theories on the development of teacher stress and leading to effective interventions (e.g. Guglielmi & Tatrow, 1998; Sass, Seal, & Martin, 2011).

- Modified versions of the model: workload, student misbehavior, harassment by peers or principals and principal support as predictors of teacher stress (e.g. Van Dick & Wagner, 2001)

Common to these models

- emphasis on stressors specific to teaching
- role of teacher’s characteristics (e.g. coping, self-efficacy beliefs)
Background

- **General occupational stress theories** have not been widely adopted in the study of teacher stress
  - focus on the **psychosocial work environment** (e.g. job demands, leadership support) as antecedents or moderators of job stress (Mikkelsen, Ogaard & Landsbergis, 2005).

- Have led to **successful work-site interventions** to improve performance and employee well-being and could be **useful conceptual tools in education contexts**.
The JDCS Model

- The most widely tested general model of job stress is the Job Demands-Control model - JDC (Karasek, 1979) and its extension, the Job Demands-Control-Social Support (JDCS) model.

- Focuses on two job characteristics:
  - **Psychological job demands (D);** i.e. work volume and pace, and
  - **Control (C);** i.e. ability to influence one’s work and make work-related decisions.
  
  Added later (Johnson & Hall, 1988)
  - **Workplace social support (S)**
The JDCS Model

- **Hypotheses**
  - *Iso-strain hypothesis*: independent effects of D, C and S on stress outcomes; supported by literature.
  - *Buffer hypothesis*: C and S buffer the effects of D on stress outcomes (moderator relationship); partially supported by literature.

**High Demand, low Control and low Social Support** are associated with worse stress outcomes.
Research with Teachers

- **Limited recent research** on the JDC/JDCS models in U.S. teachers.
  - **Santavirta, Solovieva & Theorell (2007)**: independent effects of D and C, and synergistic effect in increasing the risk of emotional exhaustion.
  - **Shyman (2011, U.S.):** Role conflict, emotional demand were the best predictors of special educator stress. Supervisor support was a weaker predictor.

Applying general occupational health models to teachers/schools can inform workplace interventions targeting teacher and school health.
Ecological Momentary Assessment

Most teacher stress research, especially in the U.S., has relied on retrospective questionnaire data which carry several sources of error and bias:

- retrieval/recall bias (Smyth & Stone, 2003)
- appraisal biases due to affective state and social desirability (Lahey, 2009; Shiffman & Stone, 1998)

Most are cross-sectional studies,

- provide only average readings of stress,
- fail to capture the dynamic process of work stress (changes over time, e.g. from class to class, day to day)

Alternative methodologies that allow real-time monitoring, identify changes over time and can lead to more accurate predictions of how stress evolves and can be reduced.
Ecological Momentary Assessment (EMA)

- Intended to **overcome limitations** of retrospective self-report questionnaires.

  - **Definition:** Repeated collection of **real-time data** on participant’s momentary states in **natural environment** with multiple repeated assessments over time. (Stone, Shiffman, Atienza & Nebeling, 2007).

  - Often use **electronic diaries** (Personal Digital Assistants – PDAs)

**Very few studies using EMA with teachers** and testing general occupation stress theories in school context.
Current study

Aims

- **Test the predictions of the JDCS model using EMA via an iPod-based Teacher Stress Diary (TSD) over 1 year.**
  1. Validate the predictions of the JDCS model (iso-strain and buffer effects) using EMA data.
  2. Investigate the impact of JDCS predictors on daily and seasonal profiles of teacher stress.
  3. Test model predictions on an expanded array of stress outcomes: affect, fatigue and cognitive function.
Method

- Prospective, longitudinal
- Follows teachers over 1 year

- 3 time-points (2011-2012)
  - 3-day assessment Fall 2011
  - 1-day assessment (before state-testing) Winter 2012
  - 2-day assessment Spring 2012
Participants 2011-2012

- SAMPLE: 187 teachers
- 6-8th grade, core courses
- 2 school districts, Greater Houston Area
- 22 Middle School campuses
- MEAN AGE: 41.05 (SD=11.32), min. 22, max. 74
- GENDER: 76.5% female
- ETHNICITY: 50.5% Caucasian, 33.7% African-American, 15.8% other

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Note. Some teachers taught multiple courses/grades; 4.3% taught non-core courses.
Measures

**Questionnaire (covariates):**
- Demographic and Professional Survey (Authors, 2010): ethnicity, gender, marital status, district, grade taught, course taught, seniority, daily workload, class size.
- **School descriptors** (Authors, 2010), collected by staff: e.g. school enrollment, number of core teachers.
- **Eysenck Personality Inventory, Neuroticism scale**

**Ecological Momentary Assessment:**
- Teacher Stress Diary –TSD (McIntyre & McIntyre, 2011)
Teacher Stress Diary

- Validated **iPod-based diary**: Cronbach alphas for scale scores range from .80-.98.
- 59 items, most with a **visual analogue scale response format** (0-100), “Not at all” to “Very”

- **Momentary Measures**:
  - **Job conditions** (last 10 min.): demand, control, support
  - **Stress responses** (now): stressed, affect, fatigue, cognition
  - **Teacher effectiveness** (previous class): Instruction, classroom climate, overall effectiveness
  - **Student behavior** (previous class): discipline, engagement, aggression, isolation
Teacher Stress Diary (TSD)

Variables

- Stressed
- Negative Affect
- Positive Affect
- Fatigue
- Cognitive Function
- Job conditions
- Social interactions
- Perceived effectiveness
- Student behavior
Teacher Stress Diary

Procedures

- Brief **training session** before classes start
- Fill out electronic **Teacher Stress Diary** in-between classes (2-3 mins./entry)
  - Teacher - personalized **alarm schedule**
  - Delay function
  - Time-stamped entries
- Fill out **questionnaires**
- End of day: **return equipment to staff**
Job-Demand-Control-Support Model Testing: EMA Data

- 6 days and 7 class periods per day: \( 5,776 \) TSD entries

**Real Time Predictors:**
- Job Demand (Mean “working hard” & “working fast”)
- Job Control
- Perceived Social Support (Emotional & Instrumental)

**Real Time Outcomes:**
- Stressed
- Negative Affect; Positive Affect
- Fatigue
- Cognitive Function (memory, attention, etc.)

**Covariates:** Neuroticism, gender, ethnicity, marital status, schedule, grade, course, seniority, workload, class size and school enrollment
RESULTS
JDCS Model Testing using EMA Stressed and Negative Affect (NA)

Independent Predictors: Iso-strain Hypothesis

- Real time Job Demand (both, \( p < .0001 \))
- Real time Job Control (both, \( p < .0001 \))
- Real time Social Support (\( p < .0004, \ p < .0001 \))

Real time data confirms main predictions of JDCS Model for Negative Affect and Stressed:
Higher demand, lower control and lower social support are associated with higher stress and negative affect.
JDCS Model Testing using EMA Stressed and Negative Affect (NA)

**Moderators**: Buffer Hypothesis

- **Control**: teachers with high C report lower NA and feeling “stressed” in response to higher demand than low-moderate C teachers (Fig. 1). (both, \( p < .0001 \))

- **Social Support** is a moderator of the impact of Demand on NA but not on feeling “stressed” (\( p = .005 \)).
  - Higher social support buffered the impact of job demand on negative affect.

Real time data confirms **buffer effects** of Control on average NA and feeling “stressed”, and **Social Support** on NA.
Figure 1. Plot of the interaction effect of Job Demand X Job Control on Negative Affect. Negative Affect and Job Demand scores vary on a scale of 0-100. **High Job Control** = Upper tercile; **Low Job Control** = Lower tercile; **Medium Job Control** = Middle tercile.
JDCS Model Testing using EMA Fatigue

Independent Predictors: Iso-strain Hypothesis

- Real time Job Demand \((ns)\)
- Real time Job Control \((p<.0001)\)
- Real time Social Support \((p<.001)\)

Buffer Hypothesis

Since fatigue is independent of demand, no buffer effects were tested.

Higher Job Control and higher Social Support are associated with lower average Fatigue.
JDCS Model Testing using EMA Cognitive Function

Independent Predictors: Iso-strain Hypothesis

- Real time Job Demand ($p=0.0005$)
- Real time Job Control ($p<0.0001$)
- Real time Social Support ($p=0.0008$)

Buffer Hypothesis

No buffer effects were found.

Real time data confirms main predictions of JDCS Model for Cognitive Function (e.g. being distracted, forgetful).

Higher demand, lower control and lower social support are associated with reported lower cognitive functioning.
JDCS Predictions of Temporal Profiles

Novel contribution of EMA
Do between-teacher differences in JDCS predict daily and seasonal profiles in stress outcomes?

- Modeled as interaction effects with time: JDCS X period, JDCS X day and JDCS X season.
JDCS Predictions of Temporal Profiles: Stress

Feeling “stressed”

- **Job Demand X Period** ($p = .022$); See Fig. 2
- D X day and D X Season were *ns*
- Interactions of Job Control X time, and Social Support X time were *ns*

Teachers reporting **high Demand** experience *pm* peak and higher end-of-day stress whereas those reporting **low Demand** show higher stress variability during the day and experience lower end-of-day stress (Fig. 2).
Figure 2. Variability in feeling “stressed” by class period, day and season, and levels of Job Demand. 7 class periods/day of monitoring. M = morning. A = Afternoon. In = Check-in prior to classes starting. Out = Check-out at the end of the last period. High Job Demand = Upper tercile; Low Job Demand = Lower tercile; Medium Job Demand = Middle tercile.
JDCS Predictions of Temporal Profiles: Negative Affect

Negative Affect

- **Job Control X Period** ($p = .050$); See Fig. 3
- C X day and C X Season were *ns*
- Interactions of Job Demand X time, and Social Support X time were *ns*

Teachers reporting **high job Control** experience **lower NA and fewer NA shifts** (peaks and valleys) than those reporting **low Control** (Fig.3).
Figure 3. Variability in **Negative Affect** by class period, day and season, and levels of **Job Control**. 7 class periods/day of monitoring. **M** = morning. **A** = Afternoon. **In** = Check-in prior to classes starting. **Out** = Check-out at the end of the last period. **High Job Control** = Upper tercile; **Low Job Control** = Lower tercile; **Medium Job Control** = Middle tercile.
JDCS Predictions of Temporal Profiles: Fatigue

– **Job Demand** X period \((p = .0004)\)
– **Job Demand** X day \((p = .049)\)

Teachers reporting **high Demand** show fatigue build-up across days within season whereas those reporting **low Demand** show daily fatigue recovery *(Fig. 4)*.

Teachers reporting **moderate-high Demand** show increased *pm* and **end-of-day fatigue** whereas those reporting **low Demand** show **end-of-day recovery**.
Figure 4. Variability in Fatigue by class period, day and season, and levels of Job Demand. 7 class periods/day of monitoring. M = morning. A = Afternoon. In = Check-in prior to classes starting. Out = Check-out at the end of the last period. High Job Demand = Upper tercile; Low Job Demand = Lower tercile; Medium Job Demand = Middle tercile.
JDCS Predictions of Temporal Profiles: Fatigue

- **Job Control** X period ($p = .002$)
- **Job Control** X season ($p < .0001$)
- **Social Support** X time (period, day season) was *ns*

- Teachers reporting **moderate-high job Control** experience expected upward rise in fatigue as day progresses whereas those reporting **low Control** have **sharp am or pm peaks in fatigue** (Fig.5).

- Teachers reporting **high job Control** experience decrease in fatigue from Winter to Spring whereas fatigue levels stay high all year for those reporting **low-medium Control** (Fig.5).
Figure 5: Variability in “fatigue” by class period, day and season, and levels of Job Control. 7 class periods/day of monitoring. M = morning. A = Afternoon. In = Check-in prior to classes starting. Out = Check-out at the end of the last period. High Job Control = Upper tercile; Low Job Control = Lower tercile; Medium Job Control = Middle tercile.
JDCS Predictions of Temporal Profiles: Cognitive functioning

- **Job Demand** X time (period, day, season) was *ns*
- **Job Control** X season (*p = .0007*)
- **Social Support** X season (*p = .022*)
- **Social Support** X day (*p = .046*)

- Decline in reported cognitive functioning (RCF) from Fall to Winter for teachers perceiving **low-moderate job Control** and **low Social Support** at work whereas RCF remains **higher and more stable** for those perceiving **high job Control** and **Social Support**. (Figs. 6 and 7)

- RCF daily profile is more stable for those with **low-moderate Social Support**, with a *pm* decline in RCF, than for teachers perceiving **high Social Support**, which show **higher but more variable RCF** (peaks and valleys in *am* or *pm*). (Fig. 7)
Figure 6: Variability in “cognitive functioning” by class period, day and season, and levels of Job Control. 7 class periods/day of monitoring. M = morning. A = Afternoon. In = Check-in prior to classes starting. Out = Check-out at the end of the last period. High Control = Upper tercile; Low Control = Lower tercile; Medium Control = Middle tercile.
Figure 7. Variability in “cognitive functioning” by class period, day and season, and levels of Social Support at work. 7 class periods/day of monitoring. M = morning. A = Afternoon. In = Check-in prior to classes starting. Out = Check-out at the end of the last period. High Social Support = Upper tercile; Low Social Support = Lower tercile; Medium Social Support = Middle tercile.
Conclusions

- **Novel contribution:** validation of the JDCS model using longitudinal and momentary assessments in teachers.

- **Dynamic temporal changes:** observed variability of stress responses by *class period, daily and by season* supports the use of longitudinal and momentary methods to study teacher stress.
Conclusions

- **JDCS Model testing:** EMA data supported the JDCS model predictions for emotional stress and cognitive functioning (*iso-strain* and *buffer hypotheses*).

- **Key predictors:** Besides *job demands*, the amount of *control* that a teacher feels over one’s work is the most powerful independent predictor of stress outcomes.
Conclusions

- **Job Control**: serves as a buffer of the impact of Demand for emotional distress, but not for fatigue or cognitive stress responses.

- **Social Support**: impacted all outcomes, being associated with reduced stress responses but only buffered the effects of Demand on Negative Affect.

The JDCS predictors seem to be useful in predicting teacher stress over the school year, when using dynamic rather than summative measures. However, its buffer effects seem better suited in the prediction of emotional distress than of cognitive responses and fatigue.
Conclusions

**Novel contribution:** in addition to average levels of stress, JDCS model can predict temporal profiles of stress (period, day, season).

- Class period variability and season changes were most affected by JDCS predictors.
- Job Demand and Job Control had the greatest impact on temporal stress profiles: high D and high C teachers showed more positive temporal changes.

The EMA approach provides more precise testing of how job conditions may affect daily stress, which can inform organizationally-based interventions to address teacher stress.
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