

**A busy life – not what it seems? Exemplar of a new approach to the study of stress.**

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Working Paper No. 39

May 2005

## ABSTRACT

As models of stress continue to develop, the need to identify proximal mediators between cultural/sociological phenomena and individuals' biological response has escalated. To track the specific dynamics of everyday life that constitute chronic stress, we asked parents in 35 families within metro Atlanta to track their activities in 15-minute intervals throughout 7 days. We derived two indices: weekday schedule complexity (frequency of venue changes like home to work), and weekday schedule parallelism (frequency of multiple simultaneous activities). From dried blood spots we determined EBV titers (reliably elevated in chronic stress). The expected relationship between both indices and EBV is U-shaped (1): very light schedules may be a marker for dysfunction, but dense schedules should be the most stressful.

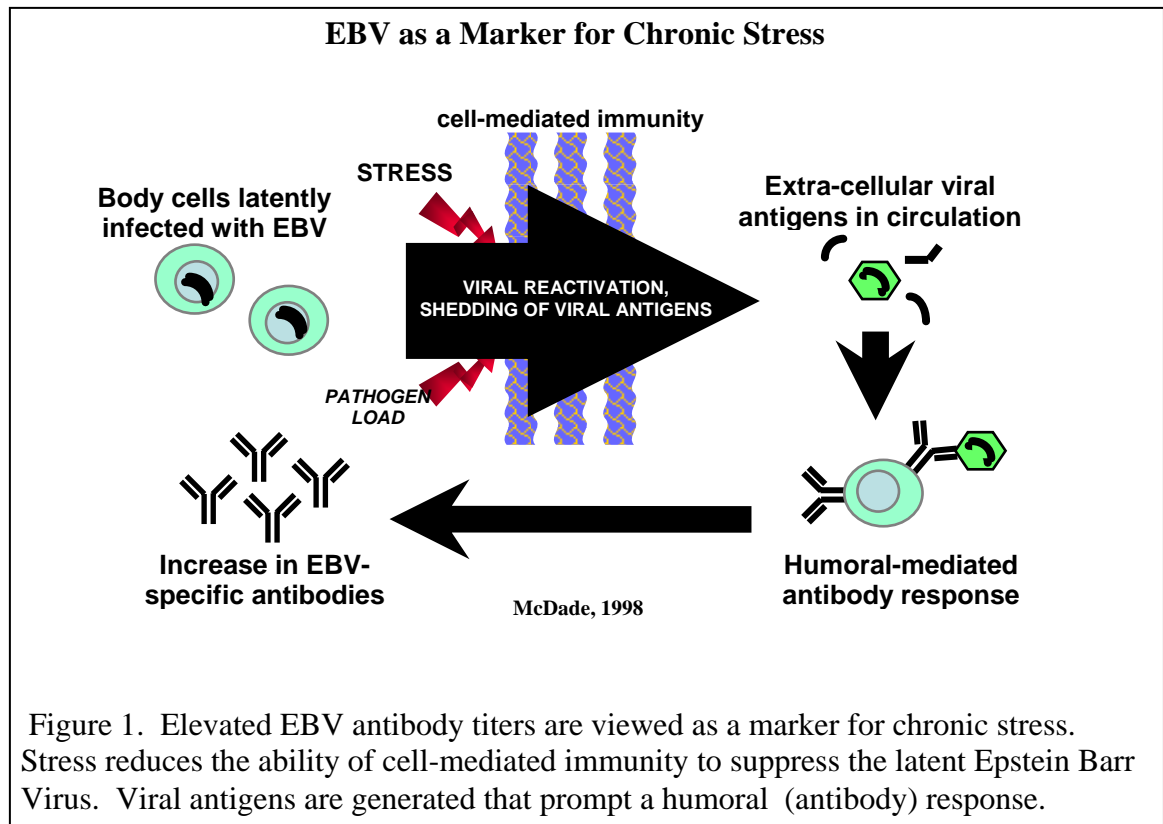
Men in the lowest and highest quartiles of complexity showed higher EBV than men in the middle ( $t=2.935$ ,  $df=19$ ,  $p<.01$ ), the expected U-shaped relationship. However, women showed no such relationship. Men's complexity varied more than women's, which may explain this difference. Men showed a moderately strong inverse correlation ( $r=-.549$ ,  $p<.05$ ) between parallelism and EBV, not a U-shaped relationship. Women, while not displaying a statistically significant pattern, trended in the opposite direction ( $r=.244$ ). Women's parallelism was higher than men's, so these may reflect two sides of a U-shaped relationship. Alternately, the genders may respond differently to scheduling characteristics, requiring explanation in terms of their distinct social realities, such as through the differential impact of work outside the home.

These data suggest that indices abstracted from detailed profiles of everyday life track significant sources of allostatic load. Further work must determine whether they also mediate or moderate the relationship between arousal and socio-structural factors such as class or gender.

## **INTRODUCTION**

Many middle-class American families report experiencing a “time bind,” wherein the complexity of their daily schedule begins to exceed their ability to easily cope. This may be viewed as an important “stressor,” with implications for health and development. Can we elucidate characteristics of the “architecture” of daily life – that is, the basic structures through which family members organize their day – that are generally experienced as stressful? How do we best measure the “architecture” of daily life, in a way that is feasible, and yet sensitive to individual, social, and cultural determinants?

We worked with 35 families in metropolitan Atlanta; each parent and one child recruited per family. We completed one week of continuous detailed logs of activities, physical and social settings, and mood using the PROUST program, a Palm Pilot-based technology developed in this lab (2). Three follow-up interviews during the sampling week allow detailed debriefing, feedback, and quality control. Blood spots were collected from parents and analyzed in the Laboratory for Comparative Human Biology for EBV antibody titers, a reliable marker for chronic stress and/or allostatic load (3). (figure 1) Additional data were collected from parents and children, including saliva samples for cortisol, questionnaires, a psychosocial assessment focused on the children, and unstructured interviews (these data are not presented here).



We aimed to generate indices of the density of the daily schedule that can differentiate between and within families, and determine relationship between schedule density and allostatic load, as measured through EBV antibody titers, separately for men and women. All analyses completed only for seropositive adults (EBV titer > 25 a.u.; 84% of men and 97% of women).

- Hypothesis: For both men and women, there will be a U-shaped pattern of association, since very light schedules may be indicative of dysfunction, but very dense schedules should be stressful.
- Alternate hypothesis: Given their distinct social ecologies, men and women may occupy distinct positions within an overall distribution that leads to a U-shaped pattern of association. However, neither men nor

women alone may display the full range of variability that leads to that U-shaped pattern.

## RESULTS

- I. Parallelism and complexity are two distinct indices of schedule density.
  - *Schedule parallelism* is the percent of 15-minute blocks during waking hours when participants report that more than one category of activity is occurring simultaneously. (figure 2)
  - *Schedule complexity* is that percent of 15-minute blocks during waking hours during which a transition occurs between major physical venues (work/home/car/store, etc.). (figure 2)
  - Parallelism and complexity are independent markers: they are correlated in neither men ( $r=.003$ ) nor women ( $r=.088$ ).

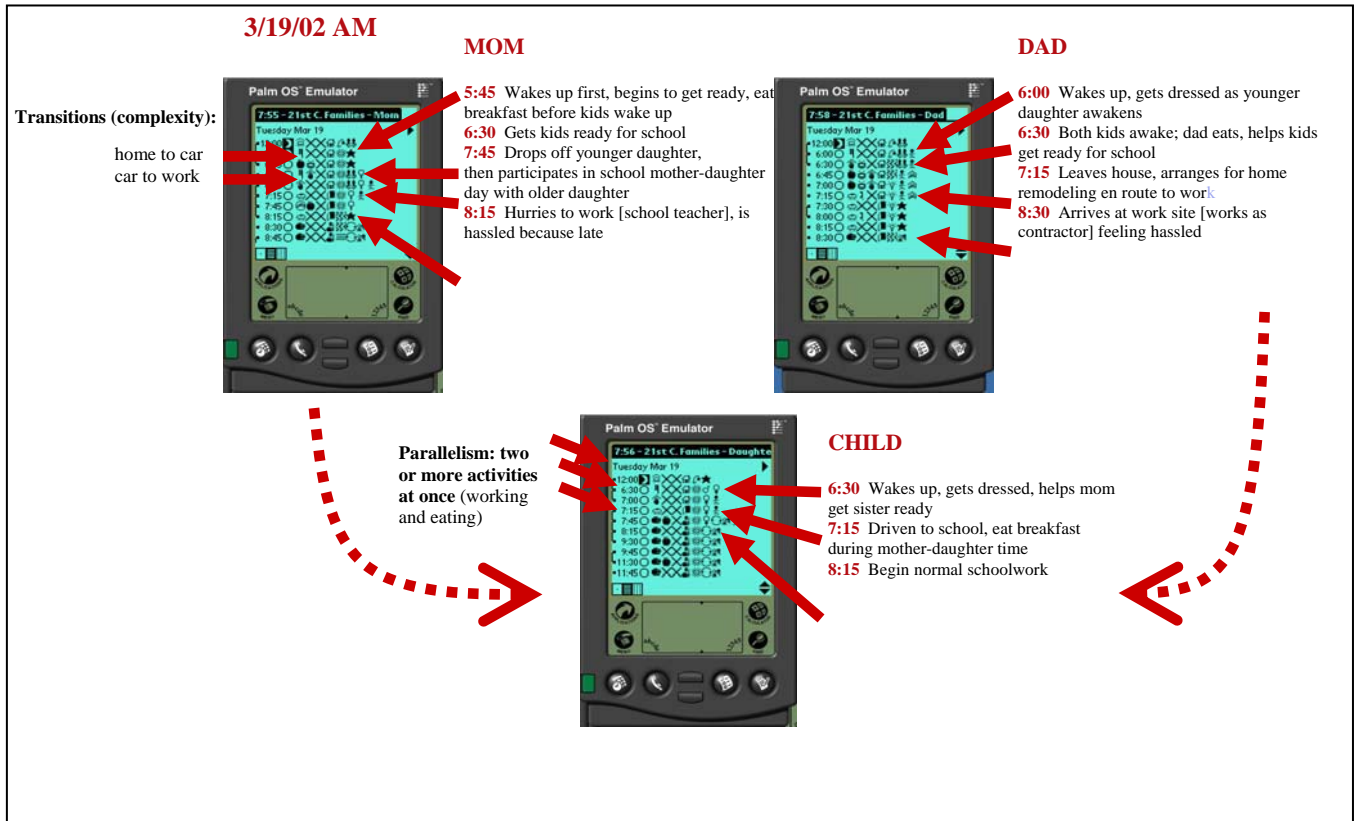


Figure 2: Illustration of PROUST Palm Pilot application, and the coding of time blocks required to generate indices of complexity and parallelism. Participants provide detailed records of activities, physical and social settings, and mood. Complexity is the percentage of 15-minute time blocks during waking hours within which a transition occurs between major physical venues (e.g., home to car). Parallelism is the percentage of 15-minute time blocks during waking hours within which the participant reports engaging in more than one type of activity simultaneously (e.g., working while eating).

II. Men show more variability in schedule complexity and EBV than women, and higher parallelism.

- Men have non-significantly higher mean schedule complexity than women (.084 vs. .075, respectively; t-test,  $p=ns$ ), with a disproportionately higher standard deviation (.36 vs. .16; Levine's test,  $p<.001$ ). Women (range: .052 - .11) are in the center of the overall distribution displayed by men (range: .034 - .17). (figure 3)
- Note that the gender-differentiated pattern for complexity is similar to a non-significant trend for EBV antibody titers in those who are seropositive: men's EBV antibody titers were non-significantly higher and significantly more variable than women's (men: mean 152 a.u., SD 78; women: mean 133 a.u., SD 59; t-test,  $p=ns$ ; Levine's test,  $p<.05$ ).
- Men have significantly lower mean schedule parallelism than women (.62 vs. .73, respectively; t-test,  $p<.01$ ), but a non-significantly higher standard deviation (.26 vs. .20; Levine's test,  $p=ns$ ). Women (range: .32 - .99) are restricted to the higher end of the overall distribution displayed by men (range: .098 - .99). (figure 4)

III. Men show the expected U-shaped relationship between schedule complexity and EBV. However, women show no relationship at all. (figure 3)

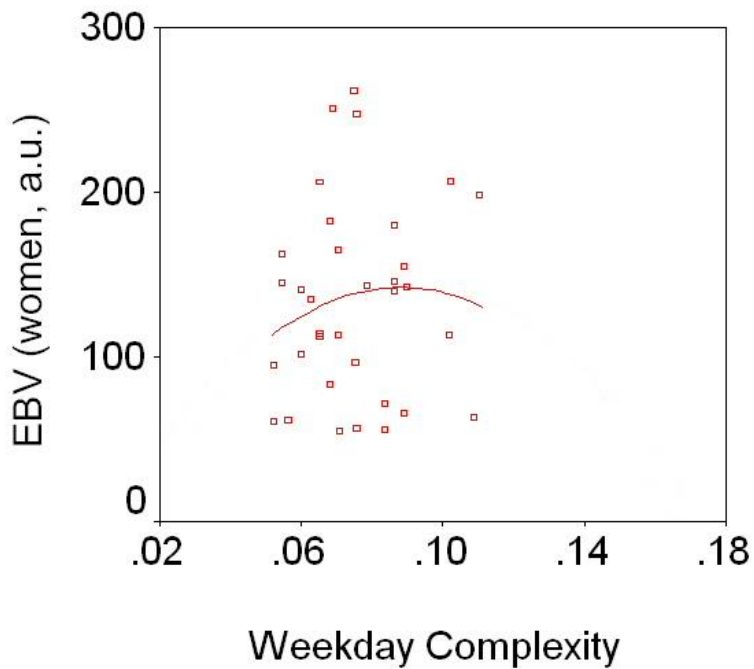
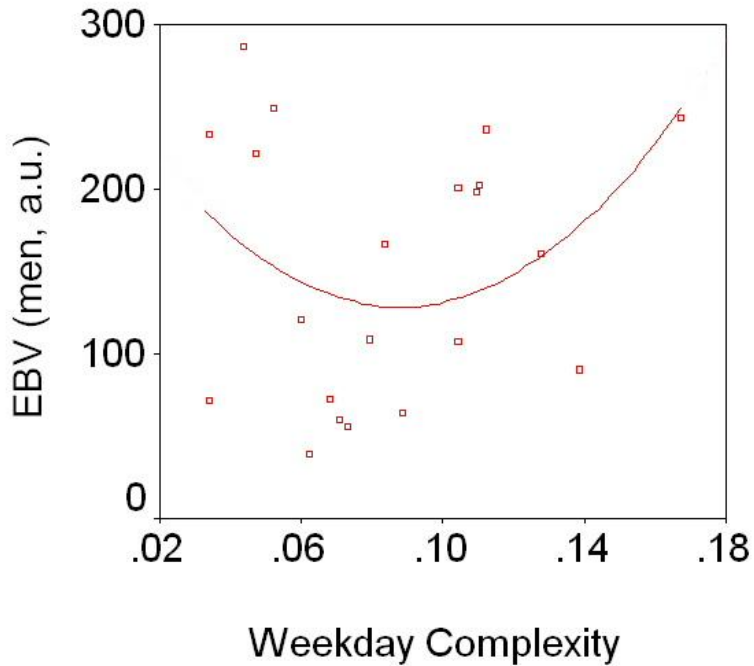


Figure 3. Men in the highest and lowest quartiles of complexity show higher EBV than men in the middle ( $n=21$ ,  $t=2.935$ ,  $df=19$ ,  $p<.01$ ). This is compatible with the expected U-shaped relationship. Women show no pattern of association between complexity and EBV. These graphics illustrate those patterns using quadratic regression lines, with  $R^2=.1360$  for men vs.  $R^2=.0211$  for women. The variation in weekday complexity is greatly restricted for women (Levine's test,  $p<0.001$ ).

IV. The complexity of men's schedules was marginally related to hours worked outside the home; the complexity of women's schedules was not.

- Analysis of association between hours worked and schedule complexity completed to illuminate any systematic differences between low-complexity and high-complexity men and women that might explain or contextualize the EBV/complexity relationship.
- For men, schedule complexity is linked to reported weekly hours worked for pay (although non-significantly), but not education, hours actually worked during the study week, time spent working while at home, time spent at the workplace, or type of job. Means are 0.069 for less than 32 hours per week (n=5), and 0.089 for 32 hours or greater (n=16) (t=-1.079, df=19, p=ns).
- For women, none of the variables listed above were associated with schedule complexity. Moreover, there was no difference in schedule complexity between single mothers and mothers in two-parent families.

V. Men display a moderately strong INVERSE correlation between schedule parallelism and EBV. However, women trended in the opposite direction: a weak DIRECT correlation. (figure 4)

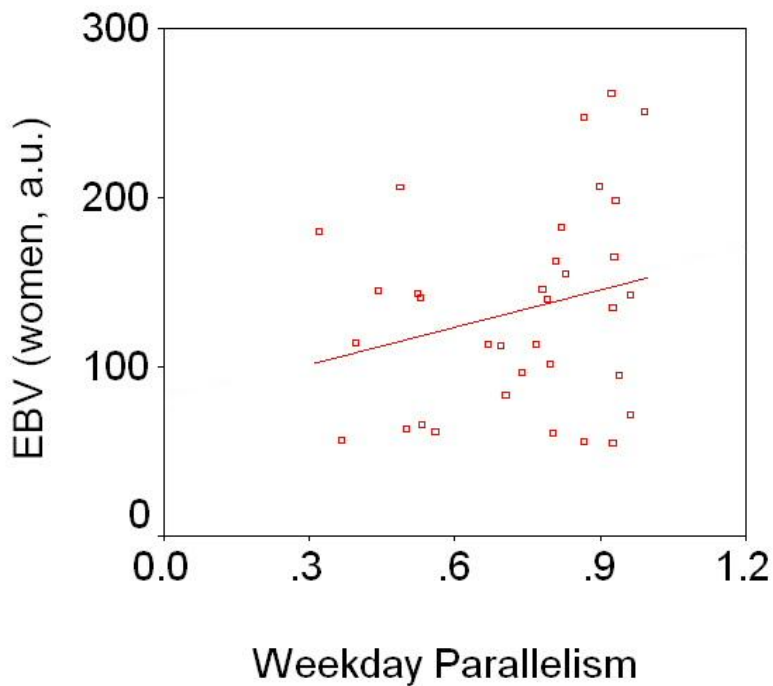
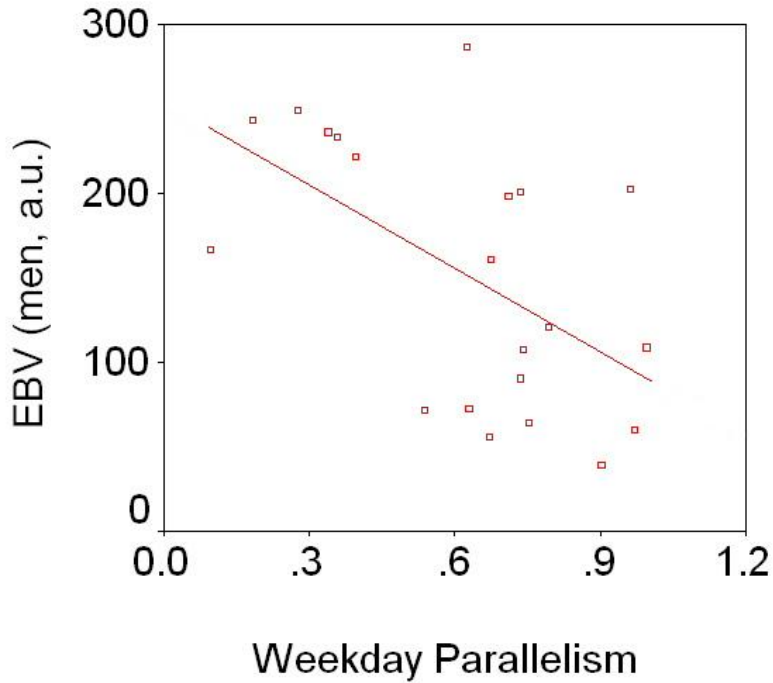


Figure 4. For men, there is a moderately strong inverse correlation between parallelism and EBV antibody titers ( $n=21$ ,  $r=-.549$ ,  $p<.05$ ). For women, the correlation is non-significant, and in the opposite direction ( $n=34$ ,  $r=.244$ ,  $p=ns$ ). These graphics illustrate those patterns using linear regression lines. The range of variation in weekday parallelism is narrower for women, but not significantly so (Levine's test,  $p=ns$ ).

## INTERPRETATIONS

The hypothesized U-shaped relationship between schedule complexity and EBV antibody titers did appear in men. Arguably, these are two very different markers for allostatic load (psychosocial and physiological).

For women, restricted variability in the middle of the overall distribution of schedule complexity values may help explain the lack of any association with EBV antibody titers. Women would be occupying the middle “flat” portion of the parabola. The complexity of women’s schedules is not associated with single parenthood, hours worked outside the home, or other work-related variables, and they seem to be operating within a narrower intermediate range for both schedule complexity and EBV antibody titers. This suggests less sensitivity than men to ecologic variation of the type considered in this study. Not surprisingly, then, we failed to see a relationship between women’s schedule complexity and allostatic load.

The opposite patterns of association (albeit weak for the women) between schedule parallelism and EBV antibody titers may yield to a similar explanation. Given the *higher* average parallelism values for women, women may be disproportionately occupying the right, upward-sloping side of the U-shaped distribution, while men disproportionately occupy the left, downward-sloping side. However, it is difficult to determine whether this is an artifact, linked to differences in the interpretation and reporting of multiple, simultaneous activities (an inherently more subjective judgment than transitions between physical venues).

Most importantly, we have found that detailed information on the daily lives of participants can be obtained in 8-day protocols that also include collecting physiological

data, unstructured interviews, questionnaires, and a psychosocial assessment battery (data not reported here). This intensive approach provides important tools for future research into the architecture of daily life and the proxemics of daily chronic “stress” to identify pathways to differential well-being.

## **REFERENCES**

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