

Introduction

Mothers of adolescents and adults with fragile X syndrome (FXS) are faced unique challenges. The impact of these challenges on mothers' daily lives and health is poorly understood. One goal of our longitudinal study is to understand the day-to-day experiences of mothers of adolescents and adults with FXS. Another goal is to understand how biological factors interact with stressful daily experiences to impact the psychological and physical well-being of mothers of adolescents and adults with FXS.

FXS is an X-linked disorder that is most commonly passed from mother to child. Mothers with the premutation of the FMR1 gene vary widely in terms of their affectedness. This is because, in part, some women have a high percentage of cells that have the normal X as the active or expressed X (*high X activation ratio*), whereas other women have a low percentage of cells with the normal X as the active X (*low X activation ratio*). The *X activation ratio* may serve as an important biological vulnerability factor, which alters the degree to which mothers with the premutation are negatively impacted by stressful daily experiences.

Individuals with FXS often exhibit behavior problems, including inattention, hyperactivity, aggression, and anxiety and autism symptoms. These behavior problems are an important source of stress for mothers. Mothers with a *low X activation ratio* (i.e., more biochemically affected) may be particularly sensitive to, or negatively affected by, their son or daughter's behavior problems.

Major Aims

1. To compare the daily experiences of mothers of adolescents and young adults with FXS to mothers of adolescents and adults without a disability.
2. To examine the extent to which mothers' *X activation ratio* interacts with the experience of their child's behavior problems to predict maternal cortisol levels, a physiological measure of stress.

Study Design & Participants

Our FXS study is an ongoing longitudinal national study of 147 mothers and their adolescent or adult children with FXS. The 131 mothers who had the premutation of the FMR1 gene and who completed the daily diary study are included in the present analyses. The daily diary involved telephone interviews on 8 consecutive days. Many mothers also provided salivary samples on 4 of these days, which allowed us to measure their cortisol.

A comparison group of 230 mothers of adolescents and adults without a disability was drawn from a nationally representative study of adults in their mid-life (Midlife in United States [MIDUS]).

Table 1. Participant Characteristics

	FXS (n=131)	Comparison (n=230)
Maternal Characteristics		
Some college + (%)	87%	66%
Caucasian	95%	91%
Married (%)	81%	75%
Child characteristics		
Male (%)	82%	51%
Age (Mean [SD])	20.6 (7.1)	19.7 (11.3)

Measures

X Activation Ratio

Mothers' X activation ratio was obtained through blood samples and analyzed at Kimball Genetics, Inc.

Daily Experiences

On each day of the daily diary, mothers were asked about how they spent their time on that day and the occurrence of stressful or positive events.

Behavior Problems

Mothers also reported on the presence or absence of 8 behavior problems on each day. Only the three internalizing behavior problems (self-injury, withdrawn/inattentive, and unusual or repetitive behaviors) were examined in the cortisol analyses.

Cortisol

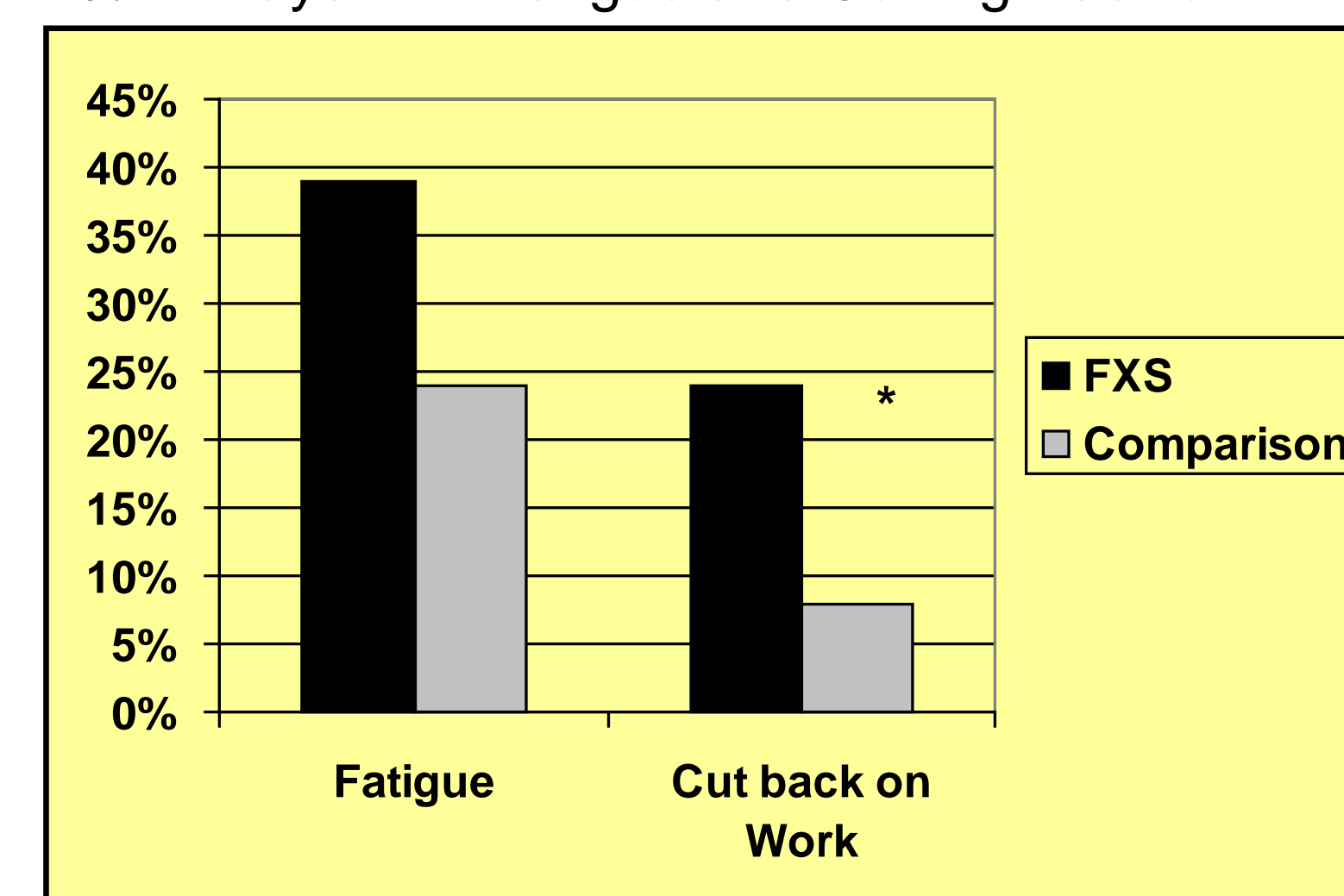
Mothers provided saliva samples at awakening, 30 minutes after awakening, lunch, and bed time on 4 days.

Results

Major Aim 1

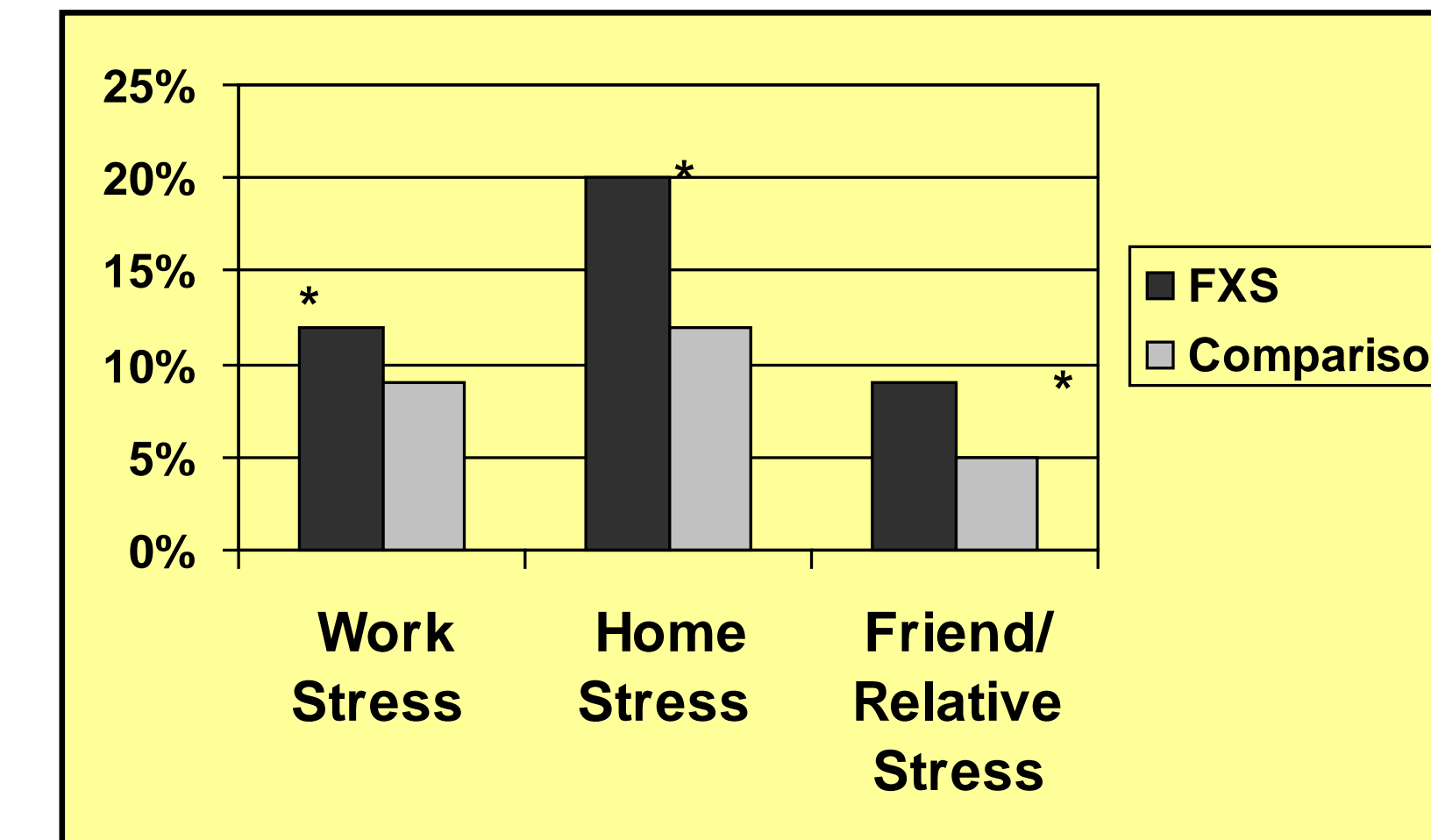
One-way ANCOVAs, controlling for maternal age and education, and child gender, were used to compare the daily experiences of mothers in the FXS sample and the comparison group of mothers. Results from these comparisons are shown in Figures 1 through 4.

Figure 1. % of Days with Fatigue and Cutting Back at Work



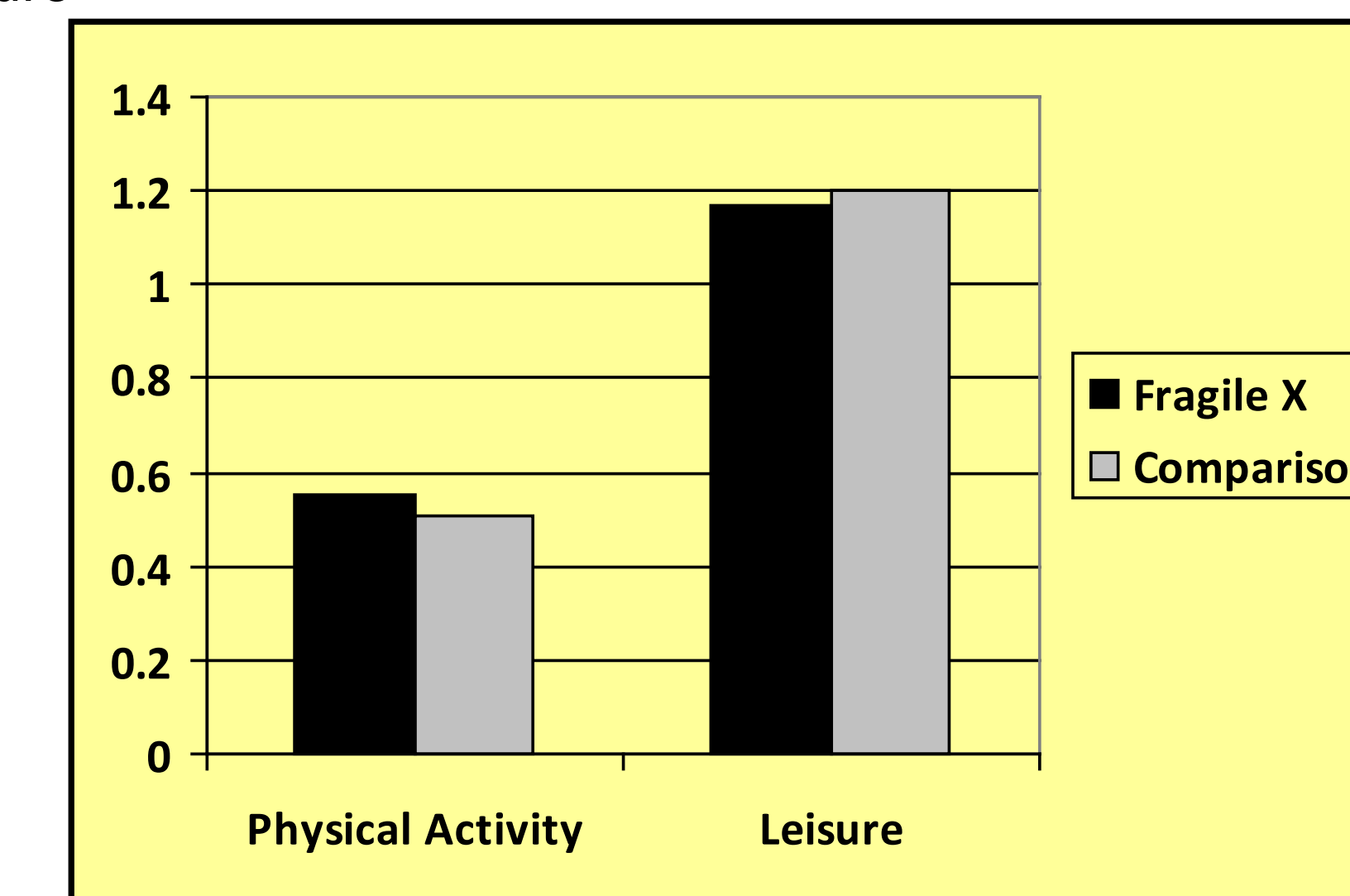
*P<.05.

Figure 2. % of Days with Stress at Home, Stress at Work, and Network Stress



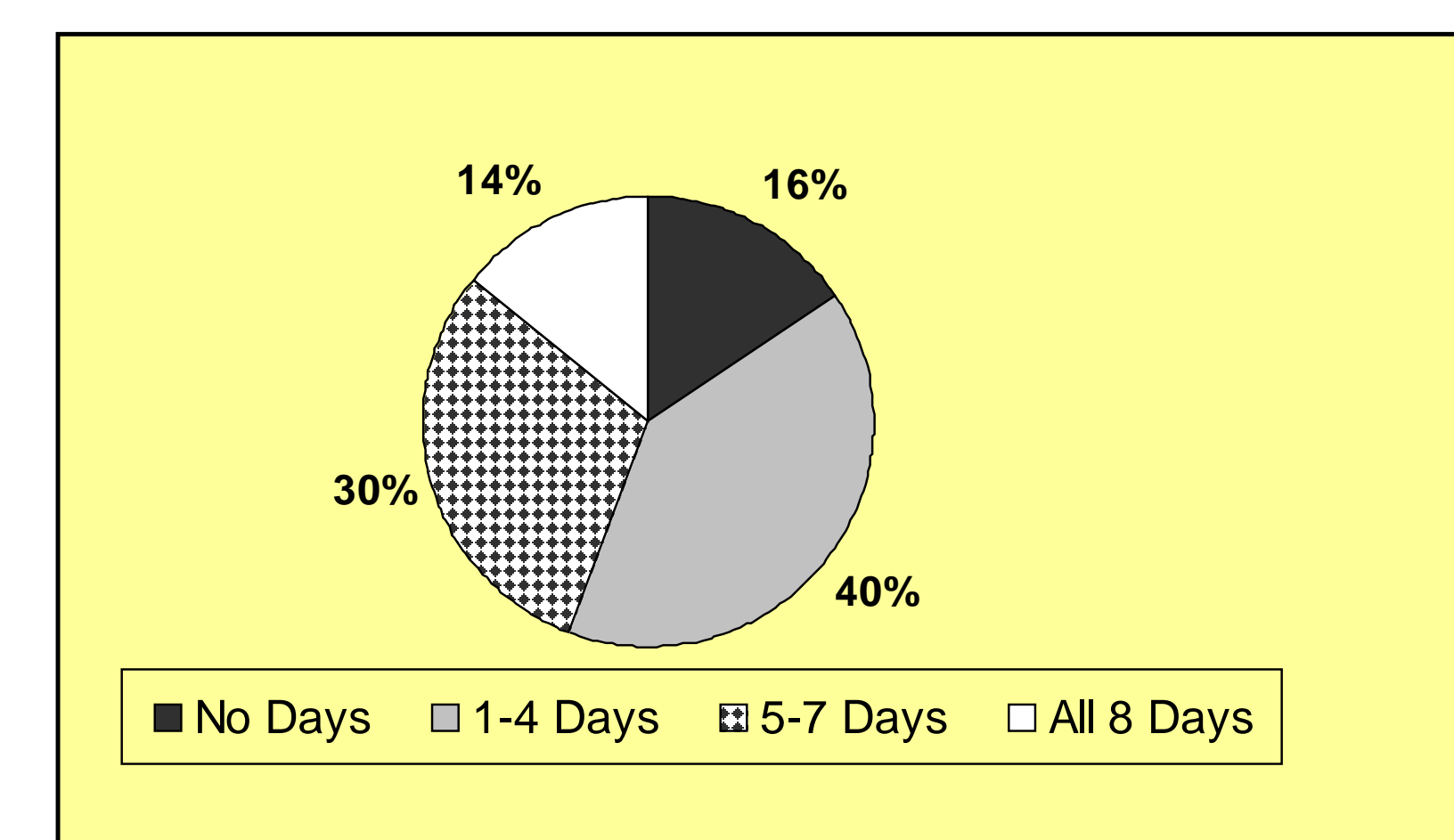
*P<.05.

Figure 3. Average Time (hours) spent in Physical Activity and Leisure



Within the FXS sample, behavior problems were frequently reported by mothers across the 8-day period of data collection (Figure 4).

Figure 4. % of Mothers Reporting that their son or daughter exhibited at Least One Behavior Problem

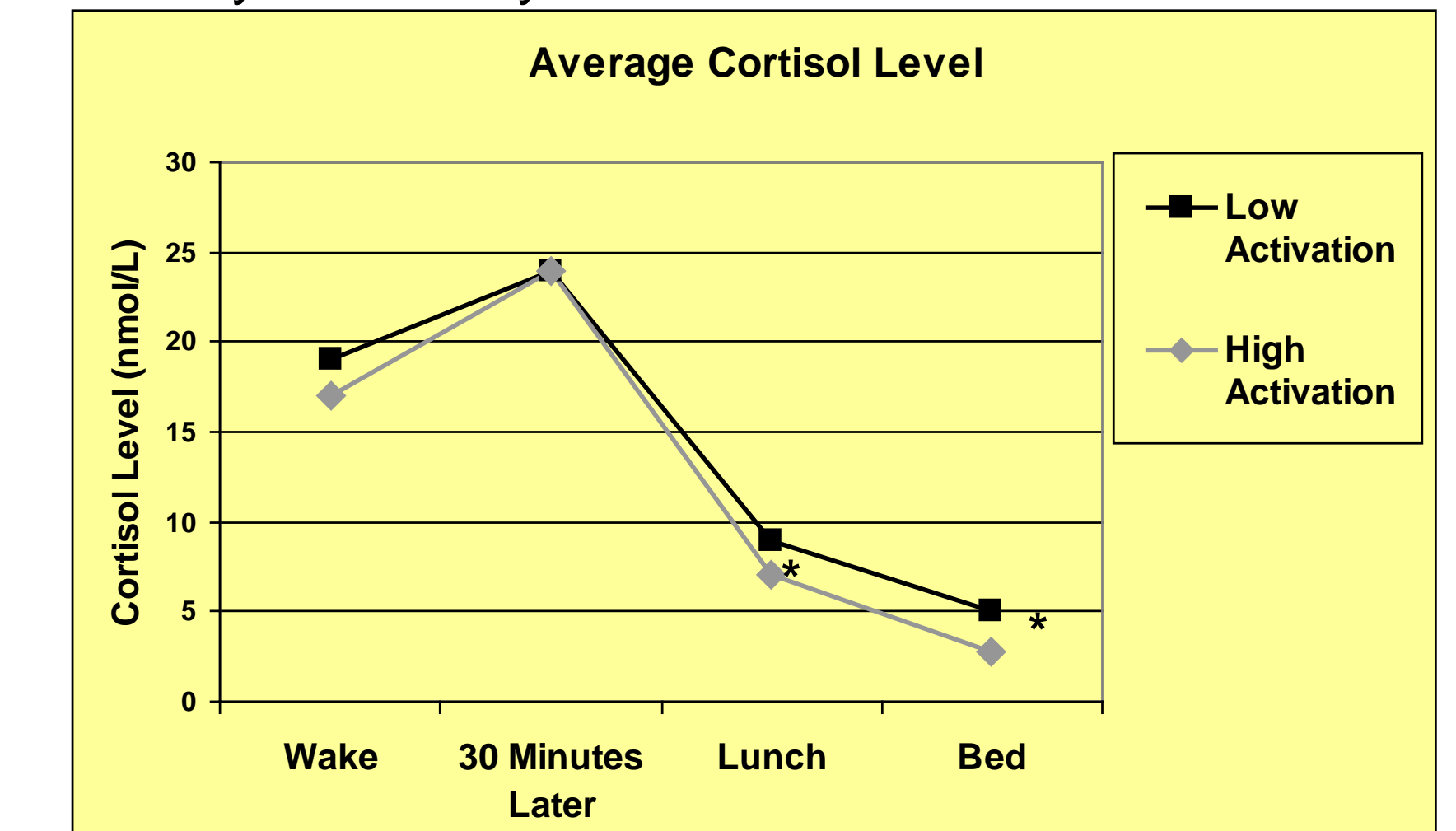


Major Aim 2

In order to examine whether mothers' *X activation ratio* serves as a biological vulnerability factor, we first examined the average daily cortisol levels for mothers with high (>mean) and low (≤ mean) *X activation ratios*.

As shown in Figure 5, on average mothers with low *X activation ratios* had a higher lunch and bedtime cortisol level than mothers with high *X activation ratios*.

Figure 5. Daily Cortisol by X Activation Ratio

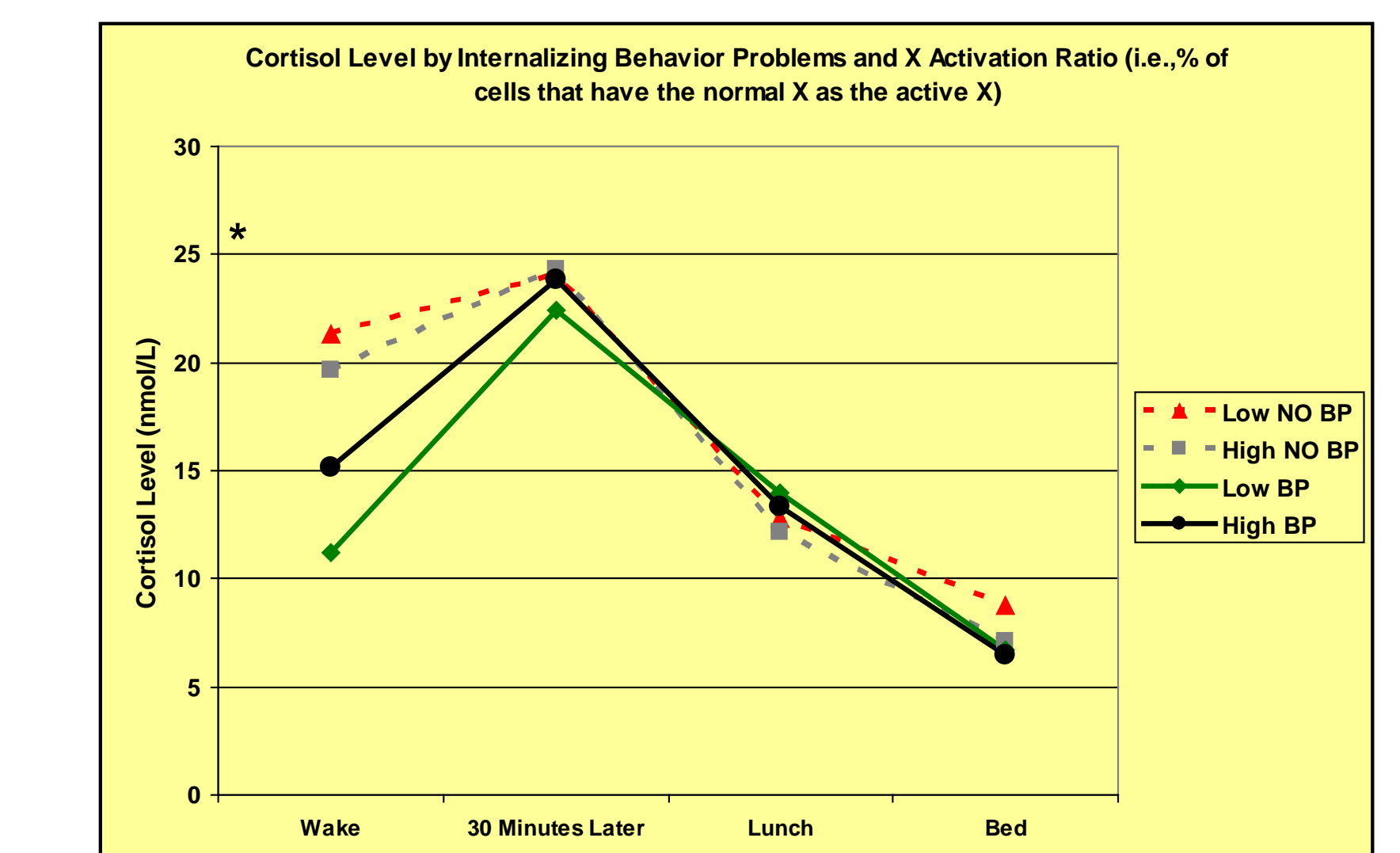


*P<.05.

Next, we compared mothers' cortisol on days following an episode of internalizing behavior problems by the son/daughter vs. on days following no internalizing behavior problems (Figure 6).

Both mothers with *low* and *high X activation ratios* had lower cortisol on mornings following behavior problems as compared to mornings following no behavior problems, indicative of severe and chronic stress. This pattern was more pronounced in mothers with *low X activation ratios*.

Figure 6. Daily Cortisol by X Activation Ratio and Behavior Problems



*P<.05.

Discussion

Our study highlights the day-to-day challenges of parenting an adolescent or a adult with FXS. However, it also highlights that these mothers still find time for positive activities. Findings suggest that biological vulnerability factors (*X activation ratio*) interact with life stress to impact the psychological and physical health of mothers with the premutation. Mothers with *low X activation* may be particularly sensitive to the negative impacts of their grown child's behavior problems. We hope to share these and other findings with researchers and care providers to give them new insights into the daily lives of mothers of adolescents and adults with FXS

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