Greenbuild 2017

Wednesday, November 8, 2017
8:00 AM

(Link to photos taken during presentation, referenced in the notes)

- **Creating an evidence-based framework for health in Buildings**
  - Speakers
    - Kevin Kampschroer
    - Esther Sternberg
    - Mariana Figueiro
    - Casey Lindberg
  - Study before and after at GSA building in Denver
  - Esther
    - Stress is a good thing - it is a key response - needed to perform at peak
    - Stressors are cumulative - "allostatic load"
      - Exacerbate negative health effects
        - Slower vaccine take rate
        - Reduced immune system
    - The building can contribute to reducing stress
    - There are key interactions between:
      - Physical activity
      - Stress and relaxation
      - Sleep
  - Casey - How Wellbuilt worked (see pic)
    - Studied 4 different bldgs
    - Used Mobile IEQ Nodes (made by Aclima) - just at work
    - Measured heartrate variability - all the time
    - Used a survey app with phone - randomly, once/hour
    - Stationary IEQ nodes on walls in bldg (also by Aclima)
    - Static spatial attributes - different configurations (proximity to windows, diffusers, etc)
    - Heart rate variability is good for us! - indicates a relaxation response (stress increases regularity)
    - Office types has measurable effects on people - Bench, cubicle, private office
      - Open bench seating moved more, even more than the min recommended amount
      - Variables (see pic)
        - Type of work - computer, mgt, technical
        - Cubicle vs bench and private vs open bench
        - Physical activity and stress
    - Findings
      - Cubicle had higher stress than bench
      - Activity at the office matter beyond the office
    - There was also a one-time survey
      - 3 categories
        - Amenities
          - Adjustability

                - Access to needed equip
                - Have enough space
            - Performance
                - Many - see pic
                - Two biggest effects:
                    - Ability to hold small impromptu mtgs
                    - Easy to hold one on one conversations at my workspace
            - Coping behaviors
                - Moving to improve sound, lighting or temp
    - Differences between one-time survey and real-time surveys - see pic
        - Real time showed people think they're able to focus about the same across space type
        - One-time showed actual perceived differences between space types (e.g. more focus in office)
    - Health effects from the environment
        - Humidity - see pic
            - We know high and low results are bad, but know less about the mid-range
            - Data showed tha about a third of the time they were outside range of 30%-60%
            - Connected humidity, Stress response and sleep - see pic
                - Humidity did have a direct effect -
                    - staying inside comfort range improved stress response and sleep!
        - CO2
            - Consistent in bldg, but not at room level - see pic
            - Headcount effect on CO2 peaks in conf rooms - see pic
                - Some rooms are much more resilient over the day than others
            - How certain are we about CO2 sensing? - see pic
                - Confidence range improves over time
                - More confidence in predicting open office vs closed room
            - Dynamic spaces - teamed with CBE - see pic
                - We're sitting in our own CO2 - CO2 is rising up, slowly (hot air)
                - Dramatic improvement from a fan! ..and from getting up and walking around
    - What can we do with reciprocal relationships - see pic
        - Workplace design can make real improvements in reducing stress and improving sleep
- Mariana
    - Circadian lighting - RPI study
        - Circadian system - see pic
            - Awake during day, sleep at night is ideal
            - Have physiological changes over a 24 hour cycle - changed by light outside
        - Affects three systems - see pic
            - Visual
            - Non-visual
            - Message
        - Light can be like a cup of coffee - the affect is about the same!
            - Go outside instead of going to Starbucks

        - Tailored lighting designed to promote circadian entrainment - see pic
            - Measured melatonin (and its suppression) to indicate how effective the light source is
            - Finding: we need higher amounts of light than are currently typ in bldgs
        - Good lighting design
            - High during day, especially morning, and low in the evening
        - Developed a "daysimeter" to measure circadian light in the space - personal light meter - see pic
        - Did a GSA study on daylight and its impact - included EGWW - see pic
            - Hypothesis: more daylight, better circadian response
            - First baselined base condition, with 7 days of data, then measured… - see pic
                - Mean sleep onset latency, Depression scores, Sleep disturbances
        - Findings - phase one - see pic
            - Lighting does matter
            - Daylighting can be insufficient if space is not managed properly
        - Phase 2 - electric light and its impact
            - Need more products to deliver more light to desk workers - see pic
            - Collected data - see pic
            - Additional light did show improvement - see pic
                - Sleepiness and subjective vitality
            - Repeated protocol in high-latitude spaces (Rykjavik, Iceland and Riga, Latvia)
                - Again showed improvements in being less sleepy and more vital
                - Interesting that there is a progresive improvement from day 2 to day 3
    - Just having a window in your space is not enough - electric light can make improvements
- Audience participation - Kevin
    - Showed a study with GSA and REWS
    - Looking for ways to keep studying the huge data set
    - Found overall that were significant effects on human health from the built environment
        - We are sleep deprived
            - Staying up later, looking at blue light right before we sleep - bad!
    - Found some aspect in every bldg that there were things that needed changing
        - EGWW cubicles ruined the daylight design
        - Seattle bldg had lots of daylight and lots of glare
    - We learned that we're designing complex systems
    - Questions from Kevin to panel:
        - What to do now around sleep studies?
            - Sleep is very important for health, so disrupted sleep is bad for health
                - Many stress related illnesses
                - Get better correlations between heart rate and sleep
            - Need to study more about affects of getting more light during the day
            - Need to collect entire data set
        - What are the effects of looking at blue light screens?
            - They’ve studied Ipads, TVs, phones

        - TVs are farther from eyes - lower effect
        - Higher light level during day really helps offset blue light effects
        - "night shift app" doesn't work unless you lower it to lowest light level (as well as changing light temp)
- Brian Gilligan from GSA joined… workplace strategist
    - Moving from private offices to shared offices
        - Saves sf per workstation, which saves $$ and carbon
        - But increases dissatisfaction of occupants
            - Need to engage people in their space design
        - We now know that there are acoustic trade offs for focus, while increasing movement, which is good for folks
- Esther learned that it is hard to actively get people to be more active…
    - Yet we know that there are real cost savings to be had by business owners if they can do this
    - Chief medical officers were happy to hear that there were passive ways to get people to be more active
- Casey said they need to study magnitude of impact vs magnitude of cost
- What would you researchers like to do with your next pot of money
    - Mariana - we're doing it: combining effects between intervention and sleep quality
        - Has been asked to quantify how it affects productivity, and how can I justify the expense for the intervention
        - Thinks we already know enough to implement some things
            - Need to increase light levels during day
    - Esther
        - Wants to link glare to the data - because it comes from too much light and increases stress response
        - Wants to add cognitive performance to the data set
        - Implement CO2 improvements today
        - Having ability to see in real time what's happening in our buildings - need more sensors deployed, and more surveys (both one-time and real-time)
            - The delta between real-time and one-time responses were significant
                - Very evident with acoustic disruptions
    - Casey
        - Wants combine data (circadian and CO2 effects)
        - Wants to link to sick days
    - Brian
        - Adjust the way we do occupant engagements
            - Look at activity levels before and after interventions
        - Wants to look at Carnegie Mellon studies and cross-reference
- How should we be thinking about sound distraction effects on occupants?
    - Casey
        - Tradeoffs between work station type
            - Tradeoff between visual privacy and auditory privacy (cubicles vs bench)
                - How to better deploy choice in the workstation

        - Have real data showing low partitions lower acoustic levels
    - Brian
        - Echoes idea that choice of space types seems to be key, with a variety of space types
        - Really important that we ventilate spaces properly (tied to study)
- Audience Q&A
    - Casey - now looking at demographics more: age, sex, personality type
    - Kim Shin - please remember that asking for increased light and ventilation needs to be done carefully, so we still do it with low energy/carbon impacts