

allele is turned on or off is dutifully passed across generation after generation. (For an evolutionary theory explaining this tension over the size of unborn children, see “Prenatal Competition,” September-October 2006, page 18.)

In closing, Michels emphasized that epigenetic inheritance may exist—but it has not been proven. And given the current epidemic of sedentary behaviors and obesity, she concluded, perhaps the mechanisms that strip our reproductive cells of the memory of such epigenetically modulated states from one generation to the next are “a good thing!”

—JONATHAN SHAW

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ATMOSPHERIC BALANCING ACT

Cognitive Benefits of Healthy Buildings

IMAGINE A BUSINESS that creates a perfectly energy-efficient environment by adjusting ventilation rates in its workplace. On paper, the outcome would seem overwhelmingly positive: fewer greenhouse-gas emissions to the environment and lowered costs to the business. It's an idyllic scenario, except for what Joseph Allen and his team at the Harvard T.H. Chan School of Public Health (HSPH) describe as the potentially serious human cost: workers with chronic migraines, nausea, fatigue, and difficulty focusing. Fortunately, these side effects are avoidable.

“The truth is, we absolutely can have buildings that are both energy-efficient and healthy,” says Allen, assistant professor of exposure assessment science. In 2015, his team published a two-part study that quantified the cognitive benefits of improved environmental conditions for workers. The first phase took place in the Syracuse Univer-



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sity Center for Excellence, where knowledge workers, such as architects and engineers, went about their regular workdays as Allen and his team manipulated environmental factors. “We weren’t looking to test an unattainable, dream-state workplace. We wanted to test scenarios and conditions that would be possible to replicate,” he explains. They adjusted ventilation rates, carbon dioxide levels, and the quantity of airborne VOCs (volatile organic chemical compounds that are emitted by common objects such as desk chairs and white boards). At the end of each day, the team asked workers to complete cognitive-function assessments in nine key areas, including crisis response, de-

Workers in optimized environments scored far better in tests of cognitive function.

and optimal thermal conditions approved by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE, which promotes well-being through sustainable, environmentally conscious technologies). Although these results confirmed the correlation between environmental factors and workplace performance that the team derived from the first phase of this “CogFX” (cognitive function) study, Allen knew he still had a major hurdle to overcome: “The decisionmaker on the

tial health benefits of better ventilation, as a counterweight. Their findings indicated that those benefits represented roughly \$6,000 to \$7,000 dollars per person per year, not including the co-benefits to health from diminished absenteeism and the avoidance of other so-called sick-building symptoms such as headaches and fatigue. “If you’re the building manager, \$40 a year [per person] might be a lot in your budget,” Allen acknowledges. “But if you’re the executive and you can juxtapose the \$40 cost [with] the \$7,000 gain on the HR side, it’s a no-brainer decision.”

Allen has lectured internationally about “healthy buildings” and led investigations of hundreds of structures housing people in many fields, yet facilitating communication among different decisionmakers, he says, remains a serious challenge. At Harvard, he advises the recently launched Healthy Building Materials Academy, an initiative that aims to close that knowledge and management gap by educating



cisionmaking, and strategy. “We saw pretty dramatic effects,” he reports: workers in optimized environments scored 131 percent better in crisis-response questions, 299 percent better on information usage, and 288 percent higher in strategy.

In the second part of the study, the team tested existing conditions in 10 green-certified, high-performing buildings nationwide, one of them Harvard’s own Blackstone South building, which has a double LEED Platinum certification. Workers in such green-certified spaces performed 26 percent better on cognitive-function assessments than those in non-certified buildings, and occupants enjoyed a 25 percent increase in sleep scores as a result of better lighting

building-management side”—focused on bottom-line heating and cooling costs, for example—“isn’t always aware of the facts on the health side, and vice-versa.”

Allen and his colleagues realized they needed to translate their results into actionable steps for building managers, developers, and owners. “The question we got right away was, ‘Well, if I double the ventilation rate, that’s going to cost me something real, and what’s that look like?’” In fact, the group found that doubling ventilation rates would cost the average American business between \$10 to \$40 per person per year.

That’s usually when the analysis stops. Instead, Allen and his team wanted to go one step further and quantify the poten-

ing buyers for campus facilities, department managers, and those in charge of construction and renovation projects. In the corporate sector, companies like Google and Kaiser Permanente have also started putting research about healthier buildings to use in their institutional decisions, he adds. Smart, progressive business leaders who understand the financial value of incorporating health into their balance sheets, he believes, will be those who take the most decisive steps toward enhancing workplace environments in the name of health—and productivity.

—OSET BABÜR

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