

**Panel Discussion
from the Symposium
"Full-Spectrum Fluorescent Lighting Effects on
Performance, Mood, and Health"**

Note. This is a transcript of a tape made of the discussion at the August 22, 1993 symposium at the American Psychological Association 101st Annual Convention held in Toronto, Ontario. Some remarks were difficult to transcribe because of the poor quality of the recording. In certain cases, at the editor's discretion, alternative phrases (inserted in brackets) were used to maintain the sense of the remark if the precise words were indecipherable. In those cases where no sensible interpretation could be made, the material was deleted. These cases are indicated by an ellipsis (...).

MODERATOR:

Well now we've heard from all of our speakers and what I'd like to open things up for some questions from floor. If you'll address your question to any one speaker or if you want to ask the same question of each of them in turn then that's fine too.

QUESTIONER #1:

I have questions for practically all of the speakers and I'd like to start with Dr. Hathaway. In your studies in Alberta were all these classrooms windowless? Or did they have windows? Were they completely windowless so that the classrooms were depending upon artificial light?

HATHAWAY:

No, all the classrooms had windows. The measures of light that we reported in the study were taken during daylight hours. The amounts of ultra-violet they had in the classroom reflected what would have been the amount that the children were exposed to. There could have been trace amounts of ultra-violet creeping in, but my guess is that the ultra-violet, no. I think the windows pretty well screened it out, because the schools did not have UV transmitting lenses. They simply measured virtually non-existent UV. We did have windows.

QUESTIONER #1:

This was very significant point because from experience if you had a window with daylight coming in... It doesn't matter so much what kind of artificial light source is in your room because with daylight, you neutralize that...and so this has to be taken in to account in the analysis of the data and when one is designing experiments it becomes like a [confounding variable. This is an important] point in the design of the experiment so I will have to reread the Alberta study bearing that in mind.

HATHAWAY:

I certainly appreciate the question. Those are questions that I asked myself too. You know, how come we're getting the difference even though there is contaminating light in here but I think when you're in a classroom unless you're right next to the window, when you're in the classroom away from the window quite a ways the light is substantially subdued and the, if you turn off the overhead lights you find a significant drop in the light left.

QUESTIONER #1:

And particularly the location because you have less daylight [at certain times of year.]

HATHAWAY:

You've got to pick the time of year when you make the measure.

QUESTIONER #1:

I'll keep the others minor. So just a few points. [Dr. Gifford:] You did mention the deficiencies of the scientific experiments in general and this does not apply to full spectrum lighting alone. But I must say that I've come across a very good [research] where many of these considerations do not count but there are measurements like hormones for instance. This is not biased by the researcher or the subject. It doesn't matter whether they recognize full-spectrum lights or not. They measure an actual parameter in the blood. So that has to be acknowledged because there are some good experiments.

Now when you talk about the people and sensitivity, yes there are people who are more sensitive and this where I'm coming from. I'm with the Canada Mortgage and Housing Corporation and we're looking at people who are particularly environmentally sensitive. And we find that these people are sensitive not only to the air quality but many of them are also sensitive to light. In fact they seem to be parallel that there are people who are sensitive to light. And so when these experiments are designed, then this is a target group of people just like people with SAD. You know, a good target to study as far as the effect of full spectrum or regular lighting.

Now I must add another point before I'm cut off, that there are good studies and ??? are not effective at all. And we have also found the group of Alan Rosenthal, they have found a critical wavelength which appears to be to have beneficial tendencies for people with SAD. And this is the green light more so than the ultra-violet or the blue and the red. And so the effect of lighting may not necessarily be on the ultra-violet but it's in the quality of the light, it's the spectral distribution in the visible region, particularly the proportion in the green or the blue region of the spectrum. And I think I should stop.

MODERATOR:

I know there are other questions.

KARPEN:

I have a couple of comments and then a couple of short questions. One should be aware that there are hazards of UV, some of which people in the United States have regulated. And the experimental evidence is fairly consistent with the mid UV, is cumulative in terms of increasing the probability of early onset of senile cataracts. And so there should be some serious questions of adding UV down in the UV-B region. Also there's some massive amount of UV coming in windows. Window glass does not cut off, except down toward the mid UV-B and lower and I have looked at least one experiment on full spectrum lighting and the daylight coming in the window is toward the magnitude coming out of the rest of the fixtures.

Also in comparing different light sources, there's strong psychological effects of colour. Certainly I think that dominates whenever you think of high pressure sodium. And the only test on ultra-violet versus non ultra-violet [that would be acceptable] to use some metameric sources. In fact you're looking at full spectrum versus non full spectrum, you need metameric sources with objective colours that are not sensitive because if there is a visual difference in colour it could be completely psychological rather than photobiological. Now I have some other comments to make but I should stop now and ask for time later.

MODERATOR:

We have other questions or?

QUESTIONER #2:

Does anybody know if anybody has been looking at T-8's and that kind of [technology] or other ballasts and lamps and things like that?

KARPEN:

Yes, I can give you some answers to that. But I have found the lamp the Duro-test is making, it's a special lamp. It's a F40 T12 with ultraviolet [and correlated colour temperature of] 7500 K. It appears to be forty per cent more visually effective than the T8 at 4100 K per lamp so we're getting

some rather significant data. I want to show you the spectral distribution of that looks like. Must be in my, unfortunately it might be in my briefcase but I think it should be pretty quick to find. I have two copies. Here we go. This is a spectral energy distribution of the Vita-Lite 75 lamp. Can everybody see this? And you can see a rather high amount of light in the purple to blue regions. Now, I want to point out that the total UV content of this lamp is about .11 watts. The Vita-Lite as we know it in studies that [Dr. Boyce] talks about, block the UV in the 380 down to 315, 310 region and there's another lamp that Duro-test has...

QUESTIONER #2:

Excuse me, I'm lost. What does this have to do with T8 versus T12 in high frequency versus other ballasts?

KARPEN:

But I'm saying that there's definitely... What I've found is that the T12 7500 K is twenty per cent more visually effective per lamp...Now, as far as the electronic ballasts, there has been studies that clearly indicate that electronic ballasts eliminate some of the fatigue and headaches that people get. There's a very good study by Wilkins in England, if you want me to I'll send you a copy of articles I have on it. There are some other studies, there's another study that I ran into just recently that appears that electronic ballasts do eliminate certain amounts of headaches and fatigue.

There's also, now as far as harmonic distortion I do know this. That it's very, that it's anecdotal.

MODERATOR:

Why don't we leave harmonic distortions for another day because that's getting into the electrical/technical side which is not the subject of today.

KARPEN:

But there are some effects and one thing I want to say is, whenever my refrigerator goes on the in the kitchen and I'm ten feet away, even though the levels of EMF is down at 0.1 or 0.3 milligauss I all of a sudden can't see as clear.

MODERATOR:

Maybe that's another area of research.

KARPEN:

That has to be looked at too.

BOYCE:

Could I make just one comment up here? Regarding ballasts, the Wilkins and Wilkinson study is very nicely done. The interesting point about it is it shows a reduction in the instance of headaches of people working under either [magnetic or high-frequency ballasts]... He shows the reductions by some so-called sensitive people. You look at the distributions of these headaches, the bulk of people that came and there's a few people that get a headache everyday, and those are the people [called specially sensitive]...You talk about very sensitive, the bulk of ...people are not specially sensitive.

The other thing is that that's your physical change to go with it and when you actually replace ballasts is that piece of magic... that you produce the modulation at increased frequencies which is why it's working at 28 kHz whereas normally you'd talk about 100 Hz. So you've got a physical change in the stimulus...

QUESTIONER #3:

I have a question for Dr. Hathaway. In your description of the study it seemed to remind me, and I have to admit in a disturbing way about a study I have in my files. This sounds very familiar to a study by a person by the name of Wolfarth. Is this the same study?

HATHAWAY:

Wolfarth did a colour study in conjunction with our light study. He didn't design our light study, he didn't do the dental study. All he has, he's reported it.

QUESTIONER #3:

My recollection is there was a...

HATHAWAY:

The first thing that I referred to was that study that we were part of.

MODERATOR:

Well three people. I'll go with this gentleman first because you haven't spoken yet.

QUESTIONER #4:

Yes. I'd like to make a comment about ultraviolet. About, I think it's maybe over twenty years ago now, it was at a time when the science of photobiology was in its infancy. And the FDA has a research arm that looks at drugs and various other things that they have control of. And because of photobiology they were concerned about all light sources, particularly fluorescent light sources because of the ultraviolet that they presumed all fluorescent light sources produced ultraviolet-A and ultraviolet-B. And they did their own experiment at their own expense to see what the effects were on tissue cultures. And this was going to indicate whether, I guess whether they were going to clamp down on the lighting industry, fluorescent lighting business and make them kowtow to the FDA regulations. And so, that could still happen obviously but their results showed that the full spectrum lamps had more ultraviolet and particularly ultraviolet-A than the standard fluorescent lamps. But all of them did produce some toxicity with the tissue cultures, apparently not enough, not significant enough for them to be concerned about at that time. But there was less toxicity in comparison with full spectrum lamps than standard fluorescent lamps.

And I have a question for Dr. Gifford to change the subject entirely and what I want to know is if anybody, if his indictment is for all lighting studies and if there any and if there is anyone doing the good lighting study? Or if he has some examples of anybody doing good lighting?

GIFFORD:

Well as I said, I don't think it's possible to do a perfect study for any area of psychology, any single study. So what I tend to look for is a constellation where perhaps somebody does a good, the best possible field study then does a good laboratory study and we hope that the results are congruent because each kind of study has its own limitations. But I don't see anybody at all doing a set of coordinated studies in the laboratory and in the field which gets rid of as many as possible of the errors that I listed. It's just a hodge-podge of errors and no replication, I'm afraid to say.

QUESTIONER #4:

I mean does this only occur, this [problem] doesn't only occur in lighting and...

GIFFORD:

No, no, no. No, no. No, no. Absolutely not.

QUESTIONER #4:

Well I don't want people going away here with the wrong idea that only all lighting people that...

GIFFORD:

Well I would say compared to some other areas there's a marked difference in quality. Nowhere is perfect, but there's a big gap between what's currently being done in lighting and what's currently being done in some other areas.

QUESTIONER #3:

I think in a related point, there is a massive discrepancy between the amount of writing about the effects of lighting and the amount of research. So in comparison to a lot of other environmental factors, lighting has received literally no attention in terms of published research reports...

GIFFORD:

If I may interject. We're talking about effect sizes here. If there is an effect size associated with full spectrum lighting, it's a very small one. I'm quite convinced of that. Other environmental variables are much more powerful alterers of physiology, of cognition, of mood, of, you know, generally speaking.

KARPEN:

I'm going to challenge that hype. I wanted to see anecdotal experience. I put full spectrum lamps with polarizers and electronic ballasts in a school, replacing cool white unpolarized magnetic ballasts. We did the work over the summer, the computer teacher comes back to school and she says "Wow, what a good job you did, I love it". We left a little office with the cool white fixture in it, it was a mistake on the plans so that stayed there for a little while. She says "Get rid of it, I can't stand it". I mean she was, this is one person whose was very very sensitive to lighting and she says "I can't stand this old thing anymore, get rid of it".

MODERATOR:

Dr. Boyce had a comment.

BOYCE:

Could I do just by your comment, point out that there are different areas of light studies been going on. Most prominently, there's lots of good deductive studies I think on visibility. Things of this sort. You want to know what you can see. There are a lot of studies of that type which points quite [clearly to conditions for good vision]... When you begin to get into areas of either cognitive stuff, cognitive stuff has virtually been untouched as far as I'm concerned. Try to find the effects of lighting there on any aspect of performance and so on. And that sort of thing. Then you're into a much looser area like Dr. Gifford spoke of and that's effectively where we are. So if you want to know how well you can see, what details you can [discriminate under specific conditions], that's fine. You can do that, and there are whole journals devoted to that. But when you get down to fine, fine behaviour...what you might call the indirect effect of lighting on work, not because you can't see but because of what you see. Then there's a whole area there which is just waiting to be explored and we haven't really been.

QUESTIONER #1:

I think that any of you have to look at the effects of lighting. Not only on people but also on plants and animals as well and take all of these effects together... you compare the spectrum... and full-spectrum lighting are very subtle effects and in the short term of the experiment that is being done how can you accurately describe what's happening in a matter of hours or days. What could be the effect over a day-long period of time when people are exposed to this light. It may be that we may have to exaggerate the effects when looking at some of the more sensitive people or even animals and plants and take them all together before we can say that there is or there is no effect on...

GIFFORD:

I'll just suggest that there is not more known about animals and plants than people. They're less extensive for any long term effects. The trouble is that if you're taking collectively you get different answers. There's not a single optimum. What is good for one system maybe really bad for another. So, while I think when we deal with people we might have to look at that independent of animals, independent of plants and other aspects.

MODERATOR:

Well it seems it's been a long afternoon so I think I'll thank you all now for attending and this is my time to put in a little plug. This session has been sponsored as part of the program of Division 34,

Population and Environmental Psychology of APA. Any of you who are APA members I would like to encourage you to consider joining our division. We're the group that does this kind of research and I know that you can get some forms from the back of room there if you're interested. Thank you all for coming.