HB

176

FISCAL NOTE

STATE OF ALASKA
2006 LEGISLATIVE SESSION

Fiscal Note Number:
Bill Version: CS HB 176(STA)
() Publish Date:

Revision Date/Time (Note if correction):
Dept. Affected: OOG

Title "An Act authorizing an advisory vote on exempting the state from daylight saving time."
RDU Elections
Component Elections

Sponsor Representative Salmon
Requester House Finance Committee
Component No. 21

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012
Personal Services						
Travel						
Contractual	1.5					
Supplies						
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	1.5	0.0	0.0	0.0	0.0	0.0
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF	1.5					
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type--Do not abbreviate)						
TOTAL	1.5	0.0	0.0	0.0	0.0	0.0

Estimate of any current year (FY2006) cost: 0.0
Mark this box (X) if funding for this bill is included in the Governor's FY 2007 budget proposal:

POSITIONS

Full-time						
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

If this advisory vote question appears on the 2006 ballot, the cost of providing information about this issue in the Official Election Pamphlet, as required by AS 15.58 is $1.5. Should the addition of this question require printing an 8 1/2 by 18 inch ballot the cost will increase to $22.0.

Prepared by: Whitney Brewster, Director
Phone 465-2644
Division Division of Elections
Date/Time 3/13/2006, 11:21am
Approved by Whitney Brewster, Director
Date 3/13/2006
Agency Office of the Lt. Governor, Division of Elections

(Revised 9/7/2005 OMB)

FISCAL NOTE

STATE OF ALASKA
2006 LEGISLATIVE SESSION

Fiscal Note Number:
Bill Version: HB 176 (STA)
() Publish Date:

Revision Date/Time (Note if correction):
Dept. Affected: Administration
Title "An Act exempting the state and its political subdivisions from daylight savings me."
RDU All
Component All
Sponsor Rep Salmon
Requester (H) Finance
Component No. 45

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012
Personal Services						
Travel						
Contractual	0.0	0.0	0.0	0.0	0.0	0.0
Supplies						
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF						
1005 GF/Program Receipts	0.0	0.0	0.0	0.0	0.0	0.0
1037 GF/Mental Health						
Other (Specify Type--Do not abbreviate)						
TOTAL	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Estimate of any current year (FY2005) cost: 0.0
Mark this box (X) if funding for this bill is included in the Governor's FY 2006 budget proposal:

POSITIONS

Full-time						
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

This bill places an advisory vote on the next general election ballot asking whether the state and all of its political subdivisions should be exempt from daylight savings time.

This bill will have no fiscal impact on the department.

Prepared by: Eric Swanson, Director
Phone 465-5655
Division Administrative Services
Date/Time 3/10/06 2:35 PM
Approved by: Michael Tibbles, Deputy Commissioner
Date 3/10/2006
Agency Department of Administration

(Revised 9/22/05 ok OMB)

ALASKA STATE LEGISLATURE

REPRESENTATIVE WOODIE SALMON

SPONSOR STATEMENT

HB 176: An act exempting the state and its political subdivisions from daylight saving time

House Bill 176, an act to exempt the state from daylight saving time, will rid Alaskans of a frustrating and pointless biannual obligation and will help to prevent the disruption of Alaskans' circadian rhythms.

Daylight saving time is a frustrating and pointless biannual disturbance of Alaskans' lives. Each April and October, Alaskans must go through the tedious chore of changing all timepieces in their homes and offices in order to conform to the time change. If this time change were particularly helpful to Alaskans, this expenditure of time and effort might be worth the energy involved. However, daylight saving time serves no purpose for the vast majority of Alaskans. The original rationale for daylight saving time was to maximize daylight; given the northern latitudes in which Alaskans live and the resulting darkness that persists in most of Alaska from late fall to early spring, daylight saving time is a senseless interference in Alaskans' lives.

Furthermore, cognitive and human environmental researchers have shown that there is an objectively verifiable disruption to humans' circadian rhythms when they adjust to daylight saving time in the fall and again when they adjust to standard time in the spring. The human body's clock is governed by "circadian rhythms" that oversee daily patterns of sleeping and waking activities including alertness and tiredness, as well as virtually every other human biological function. Circadian rhythms are part of our hardwired physiology, and cannot be easily reset like the hands of a clock.

Several other U.S. states and territories have chosen exemption from daylight saving time. These include Hawaii, American Samoa, Guam, Puerto Rico, the Virgin Islands, most of the Eastern Time Zone portion of the State of Indiana, and the state of Arizona (not the Navajo Indian Reservation, which does observe daylight saving time.) Alaska will certainly not be alone in choosing to exempt itself from observance of daylight saving time.

I respectfully urge your support for House Bill 176.

State Capitol • Juneau, AK 99801-1182 • (907) 465-4527 • Fax (907) 465-2197
Representative_Woodie_Salmon@legis.state.ak.us

ALASKA STATE LEGISLATURE
REPRESENTATIVE WOODIE SALMON

SECTIONAL ANALYSIS

An act exempting the state and its political subdivisions from daylight saving time

Section One exempts the state from adherence to the federal law establishing daylight saving time.

State Capitol • Juneau, AK 99801-1182 • (907) 465-4527 • Fax (907) 465-2197
Representative_Woodie_Salmon@legis.state.ak.us

Johns Hopkins Focus: See the Light

The amount and timing of daylight can have a major impact on everyday life.

We are, all of us, slaves to the daylight. Sunlight is, after all, the "spark of life," without which there would be no plant growth, no photosynthesis, no oxygen. On a more personal level, light causes normal physiological fluctuations that can affect the way we feel, think and sleep. Depending on persona' sensitivity and the extent of light changes, the effects can range from mild fatigue to severe depression.

Getting into the rhythm

What keeps us tied to the light is a cleverly balanced internal clock, known as circadian rhythm, that synchronizes a variety of physiological systems including heart rate, body temperature and, most importantly, sleep cycles. The clock is set by light; it can be reset by changes in the timing or duration of light exposure.

"Most of us don't think twice about our circadian rhythms," says David N. Neubauer, M.D., assistant professor of psychiatry and behavioral sciences at the Johns Hopkins University School of Medicine and associate director of the Sleep Disorders Center. "We take for granted that we become tired and sleepy at night, awake and alert during the day. We notice the effects only if our internal clock is 'out of sync.' For example, in my sleep disorders research, I see people with circadian rhythm disorders who cannot follow a normal sleep-wake cycle. Instead, they experience 'delayed sleep phase syndrome' or 'advanced sleep phase syndrome'; in other words, they're night owls and early birds." Night owls may be unable to fall asleep until 3 or 4 a.m. — and then they sleep too late. Early birds fall asleep easily but often awaken during those wee hours.

Most people notice the effects of circadian rhythms when they gain or lose time or during seasonal changes in light. Even small changes can cause dramatic symptoms in some people. Many travelers have experienced the lethargy, sleep disruption, difficulty concentrating and general "fuzziness" that occur with jet lag. Depending on the individual, those symptoms can persist for up to a week. And although one hour seems almost inconsequential, the semiannual change to and from daylight-saving time is enough to nudge some people into the same set of symptoms. Studies have found an increased rate of driving accidents the day after the spring time shift — more than may be explained by the simple loss of an hour's sleep.

According to Dr. Neubauer, no one knows exactly how light produces such strong effects. One theory is that light affects production of the hormone melatonin, which in turn influences the sleep-wake cycle. We know that melatonin levels vary throughout a 24-hour period, with large amounts produced at night and nearly none during the day. If you turn on a bright light in the middle of the night, when melatonin production is usually highest, that production temporarily stops.

Scientists are currently studying the use of melatonin supplements to correct circadian rhythm disorders. "In the meantime," Dr. Neubauer warns, "don't take the hormone without first consulting a doctor. Taken at the wrong time or in high doses, melatonin can cause sleepiness, sleep disturbance and impaired work or driving performance — and it may actually shift circadian rhythms in the wrong direction." Moreover, since the Food and Drug Administration doesn't regulate melatonin and

other "dietary supplements" for safety and efficacy, there are no standards for purity or dosages.

Why so SAD?

It's not unusual to be tuned to the seasonal shift in daybreak. Many people tend to sleep slightly later in the wintertime, when it's dark in the morning, and wake up somewhat earlier in the summertime, when dawn comes early. People with Seasonal Affective Disorder, however, have a much stronger, sometimes overwhelming response to that seasonal fluctuation in daylight.

"SAD sufferers regularly experience mood changes that emerge in the autumn, peak in the winter, then vanish in the spring," says Dr. Neubauer. "Along with being tired and depressed, people with SAD also tend to overeat and oversleep in winter, almost as if their bodies were preparing for hibernation. Most sufferers never seek help for the disorder or receive treatment."

Studies have shown that the prevalence of SAD varies with latitude. The farther north you go, the more likely you are to have the disorder. If northerners with SAD travel south in winter when they are depressed, they usually feel back to normal within three or four days. When they return home, their symptoms also return in a few days.

In the early 1980s, researchers discovered that simulating summer daylight — with extra light exposure in the early morning and late evening — often eased symptoms of SAD. Today, the best treatment for SAD is phototherapy, also called bright-light therapy.

Resetting the clock

For people with SAD, says Dr. Neubauer, 30 minutes to two hours of treatment with bright light is as effective as anti-depressant drugs. For jet lag, time changes and circadian rhythm disorders, the internal clock can be reset in either direction — shifted forward or backward, depending upon when light is used. Morning light is best for jump-starting the day for those who need to advance their internal clock, while evening light lengthens the day, delaying the internal clock.

Phototherapy requires high-intensity light boxes designed to provide 2,500 to 10,000 lux (a unit of illumination) at a distance of one to two feet. Banks of fluorescent bulbs provide intense but diffused light without ultraviolet radiation. You can find light box manufacturers listed on the Web site of the Society for Light Treatment and Biological Rhythms (**www.sltbr.org**). Be sure to talk to your doctor about your symptoms before attempting any self-treatment on your own

Other bright ideas

For people who just want to smooth out their sleep-wake cycle and who don't have a serious circadian rhythm problem, Dr. Neubauer suggests these simple measures to manipulate exposure to light:

- If you get up in the middle of the night, avoid turning on bright lights. Light suppresses melatonin production and may make it more difficult to fall back to sleep. Put dimmer switches or nightlights in bathrooms and hallways.
- If you have trouble arising in the morning, maximize the amount of light in your bedroom as soon as you wake up.
- If you wake up too early in the morning, minimize the amount of dawn light. Wear a sleep mask or put blackout curtains on your windows. When you awake, keep lights dim to help gradually shift your usual pattern.
- Get plenty of sleep during the days and weeks before traveling across time zones, or when daylight-saving time begins (the first Sunday in April) and ends (the last Sunday in October). Starting fully rested will ease the transition.
- When traveling, get into the day/night cycle of the time zone you're going to as quickly as possible after you arrive. Don't hide in dark museums or hotel rooms upon arrival at your destination — stay out in the daylight.

Updated March 2004

(UPDATED MARCH 2005)

ABOLISH DAYLIGHT SAVING TIME IN ALASKA

SUPPORT ALASKA HOUSE BILL (HB) 176
AND SENATE BILL (SB) 120
"ELIMINATE DAYLIGHT SAVING TIME"
INTRODUCED IN FEBRUARY 2005

BY LEGISLATION OR BY CITIZEN INITIATIVE, ALASKANS CAN REPEAL DAYLIGHT SAVING TIME IN ALASKA

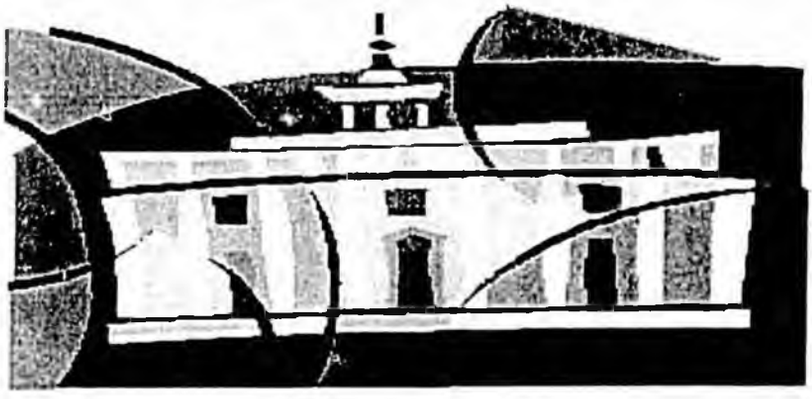
THE LAW: "Under the Uniform Time Act, moving an area on or off DST (Daylight Saving Time) is accomplished through legal action at the state level." (Daylight Saving Time, Heidi G. Yacker,Congressional Reference Division, Congressional Research Service, Library of Congress, No. 98-99C, Feb. 1998. http://webexhibits.org/daylightsaving/congressionalResearchService.html

A MAJORITY OF ALASKANS FAVOR REPEAL.

A STATEWIDE POLL CONDUCTED BY DITTMAN RESEARCH IN APRIL 2004 SHOWS THAT 58% OF ALASKANS FAVOR REPEAL OF DAYLIGHT

SAVING TIME (see appendix for poll data)

DAYLIGHT SAVING TIME IMPACTS ON EVERY ALASKAN TWICE A YEAR AND ITS CONTINUED USE IS WORTHY OF A FULL DEBATE AND VOTE BY THE ENTIRE STATE LEGISLATURE



Legislation has again been introduced to end the use of Daylight Saving Time in Alaska. House Bill 176 and SB 120 (both titled "ELIMINATE DAYLIGHT SAVING TIME) were introduced in February 2005. This is the third attempt in six years to rid Alaskans of this public nuisance. Only public pressure will assure success. Past efforts have been stymied by House Legislative Committee Chairmen who either refused to hold hearings, or refused to allow the bill to advance. Legislation to repeal Daylight Saving Time was introduced in 1999 (House Bill 4) and 2002 (House Bill 409). Both bills died in committee. (1999 Bill History) (2002 Bill History).

A simple telephone call, letter, Public Opinion Message (POM) or email will let the Alaska State Government know how you feel. Contact your State Representative, Senator, and the Office of the Governor and ask them to support HB 176 and SB 120 (ELIMINATE DAYLIGHT SAVING TIME) the current legislation to repeal Daylight Saving Time in Alaska. The Division of Election publishes a list of Alaska's elected officials . During the Legislative Session (January - May) you may call your Legislative Information Office for help to contact a politician.

AN ARGUMENT TO REPEAL DAYLIGHT SAVING TIME IN ALASKA

"THAT GOVERNMENT IS BEST WHICH GOVERNS LEAST"

(THOMAS PAINE)

FIRST, WE HAVE DONE ENOUGH TIME ZONE CHANGING AND DAYLIGHT SAVING TIME MAKES A BAD SITUATION EVEN WORSE:

Prior to 1983 the great state of Alaska spanned four time zones. The continental United States spans four time zones. Use of four time zones allowed the noon hour to coincide with the highest position of the Sun in the sky across Alaska.

In 1983, the Bering, Yukon, and Alaska Time Zones were combined into a single time zone and our politicians forced all Alaskans (except for those in the far western Aleutians) to share a time zone with the Capital in Juneau. Prior to 1983, using four time zones allowed "sun time" and "clock time" to be synchronized. "Political Time" was created in 1983.

"Political Time" has no regard for the position of the sun in the sky.

To create "Political time", clocks were permanently advanced in the time zones west of Juneau. Advancing clocks is using Daylight Saving Time. In 1983 Alaska went on permanent Daylight Saving Time.

But forcing all of us into a common time zone did not satisfy a few special interests. Even though we have already changed time zones to please these people, we are still required to change our clocks (and every other time keeping device we own) twice yearly.

From April to October Alaska is actually on double Daylight Saving Time in Alaska. The situation is so bizarre that during periods when Daylight Saving Time is in use, the Sun is highest in the Sky at 2:00 PM in Anchorage and 3:00 PM in Nome. An interesting discussion of this subject is in Ned Rozell's Alaska Science Forum Article #1278 "Alaskans Double Their Daylight Savings".

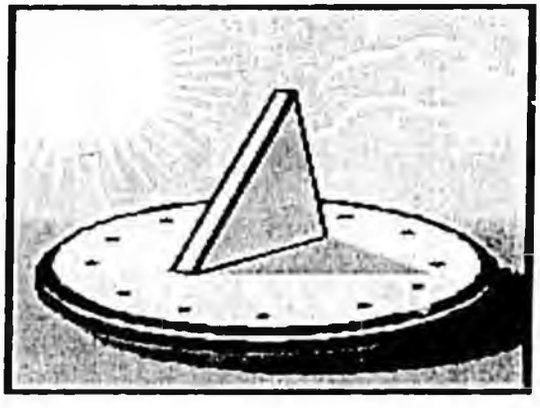
SECOND, ALASKA'S ECONOMY IS NOT HELPED BY DAYLIGHT SAVING TIME:

Did the 1983 time zone change in Alaska, and did our subsequent use of Daylight Saving Time, result in any measurable positive economic benefit to Alaska? If our economy benefits from using Daylight Saving Time then we must have by now gained a significant advantage over economies of Hawaii and Arizona; the territories of Puerto Rico, Virgin Islands, and American Samoa; the Canadian Province of Saskatchewan; and the Nations of China and Japan. None of these locations, among many others, use Daylight Saving Time. In

fact, Alaska can exploit its time zone differences to provide services during what would be non business hours in other locations.

The "it benefits commerce" rationale for keeping Daylight Saving Time is in fact a canard used by a few people who want every Alaskan to support their lifestyle. Business hours cannot be the same everywhere unless we all move into the same time zone. Maybe in the past, when business communications were limited to the rotary dial office telephone and the western union telegram, being close to Seattle time or New York time was helpful. However, now we have e-mail, faxes, pagers, voice mail, internet contact, and cell phones which allow you to reach any person or business location at any time of the day.

THIRD, WE ARE PEOPLE WHO LIVE IN THE "LAND OF THE MIDNIGHT SUN":



According to the US Naval Observatory, the Sun rose in Anchorage on April 3, 2004 at 6:14 AM and set at 7:52 PM. The next day, a Sunday morning, saw the return of Daylight Saving Time, and the time of daylight and sunset was instantly an hour different than it was on

Saturday. April 3rd. On Sunday those who forget to "spring forward" were an hour late for church, missed airplane flights, and were late for any other function if they showed up on Sunday using the previous day's time. Of course, by advancing our clocks we didn't really gain a thing, and the length of the day on Sunday April 4th was really only 6 minutes longer than it was the day before.

On June 21, 2004 (the longest day of the year), in Anchorage, the sun rose at 4:20AM and set at 11:42PM for a total of 19 Hours 22 Minutes of daylight, with not a second of daylight added by use of Daylight Saving Time.

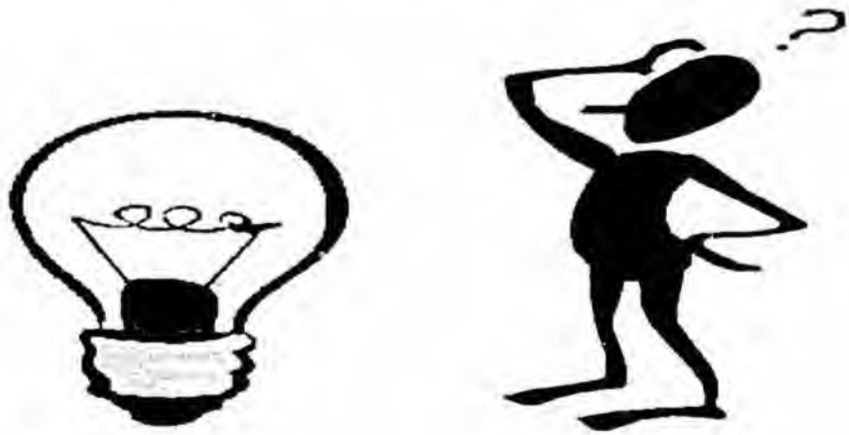
This clock changing is seen as "progress" to some. To please the minority, every Alaskan has to go through the clock changing drill twice a year. Our biological clocks which control our rhythms of sleep, hunger and other life patterns will have once more been assaulted by state sponsored jet lag. Overall public safety and job performance is impacted by sleep depravation. With regard to public safety, delaying sunset also delays sunrise the next morning. What benefit you may gain by more light in the evening may be lost in the extended darkness of the next morning.

This summer of 2004 saw several days of record breaking high temperatures in Alaska. The heat of the day lasted long into the evening partly because Daylight Saving Time has caused the sun to be at its highest in the mid afternoon. In Anchorage, when you arrived home from work at 5:00 PM Alaska Daylight Saving Time you were arriving at 3:00 PM "sun time" and the heat of the day was just beginning to subside.

Some contend that Daylight Saving Time provides daylight for

recreation. This may be true in the lower 48 where day length is about the same year round. That certainly shouldn't be a concern in the "land of the midnight sun". One of the greatest natural resources we have are our long summer days that nature provides, and in this case, nature does not need the assistance of the Alaska State Legislature. At the time of year when we began Daylight Saving Time, we are gaining approximately 6 minutes of real daylight each day. If you want an extra hour of daylight in April, wait 10 days.

FORTH, THERE ARE NO ENERGY SAVINGS FOR ALASKANS BY USING DAYLIGHT SAVING TIME:



If the sun is shining you won't need to turn on the lights and you save energy. Saving energy is the official government reason for using Daylight Saving Time. Time zones may have been adopted for the benefit of commerce, but Daylight Saving time was enacted to save energy. As far as the Federal Government is concerned, Daylight Saving Time was adopted to save energy, not to benefit commerce, not to insure that Alaska is no more than one hour from Seattle, and not to

allow you to play sports late in the evening.

I contacted ENSTAR Natural Gas Company, Matanuska Electric Association, and the Regulatory Commission of Alaska, asking if use of Daylight Saving Time had any impact on energy consumption. None of these agencies has any historical data relating to energy saving and the use of Daylight Saving Time. The consensus was that because of our rapidly changing length of day, Daylight Saving Time can have little impact on energy consumption. Temperature and extended periods of darkness impact energy useage - fiddling with the clock does not.

Has any government agency or business in Alaska praised the use of Daylight Saving Time for saving energy?

LASTLY, THE MAJORITY OF ALASKANS ARE NOT ALONE IN THEIR DESIRE TO END THE USE OF DAYLIGHT SAVING TIME.

Alaska is not the only place where Daylight Saving Time causes problems for its Citizens. This web site has been linked to a web site in Australia http://www.lightofday.primetap.com/Index.html where the use of Daylight Saving Time is being contested. Many of the same issues that cause contention in Alaska cause similar contention in Australia, Mexico and other locations. Daylight Saving Time is not the great

benefactor that some would like you to believe and its continued use needs to be justified.

DAYLIGHT SAVING TIME IS A WASTE OF TIME FOR ALASKANS.
CONTACT YOUR LEGISLATOR
REPEAL DAYLIGHT SAVING TIME IN ALASKA NOW!
THANK YOU.

LYNN WILLIS, EAGLE RIVER

APPENDIX
THE DITTMAN RESEARCH POLL DATA

THE SURVEY QUESTION: In early April, Alaska switched to Daylig[illegible]ing Time. In October , we will adjust our clocks and switch back again. What is [illegible]n about that- do you support Alaska switching to Daylight Saving Time for the [illegible]mer and then switching back in the fall, or should we leave our clocks the same througnout the year? n=550

	UNSURE	SWITCH CLOCKS	KEEP SAME ALL YEAR	BASE
TOTAL	5%	37%	58%	100%

LOCATION	UNSURE	SWITCH CLOCKS	KEEP SAME ALL YEAR	BASE
RURAL	0%	30%	70%	11.1%
CENTRAL	7%	37%	56%	13.9%
SOUTH-CENTRAL	8%	26%	67%	23.0%
ANCHORAGE	4%	41%	55%	39.9%
SOUTHEAST	5%	55%	40%	12.1%

TIME IN	UNSURE	SWITCH	KEEP SAME	BASE

ALASKA		CLOCKS	ALL YEAR	
0-4 YEARS	0%	26%	74%	2.4%
5-9 YEARS	9%	46%	45%	5.0%
10-14 YEARS	9%	46%	45%	4.5%
15+ YEARS	5%	37%	59%	88.0%

AGE	UNSURE	SWITCH CLOCKS	KEEP SAME ALL YEAR	BASE
18-29 YEARS	4%	63%	33%	6.4%
30-44 YEARS	4%	42%	54%	22.3%
45-59 YEARS	5%	34%	61%	50.4%
60 PLUS	7%	32%	60%	20.9%

REGISTRATION	UNSURE	SWITCH CLOCKS	KEEP SAME ALL YEAR	BASE
DEMOCRAT	7%	40%	52%	15.0%
REPUBLICAN	4%	37%	60%	25.6%
NON-PARTISAN	5%	38%	57%	51.8%
OTHER	9%	24%	67%	7.6%

GENDER	UNSURE	SWITCH CLOCKS	KEEP SAME ALL YEAR	BASE
MALE	7%	35%	58%	52.5%
FEMALE	3%	40%	57%	47.8%

EMPLOYER	UNSURE	SWITCH CLOCKS	KEEP SAME ALL YEAR	BASE
FEDERAL	7%	25%	68%	7.5%
STATE	2%	36%	62%	9.7%
LOCAL	1%	41%	58%	11.2%
PRIVATE	5%	39%	56%	45%
NOT IN WORKFORCE	9%	36%	56%	26.6%

Springing ahead can make us feel like falling behind

Spring forward, fall back. It's a catchy phrase that helps us remember how to change our clocks in the transition to daylight-saving time in the spring and back to standard time in the fall.

And while the switch to daylight-saving time April 7 will mean most of the nation will enjoy longer evenings, a University researcher says the change can have quite an impact on our "biological clocks."

James S. Ferraro, an associate professor of physiology, studies circadian rhythms, the internal clocks that regulate sleep and other activities in everything from amoebas to humans. "All organisms have an internal clock," said Ferraro. "That clock basically establishes a pattern, or daily rhythm, that controls how we function. It works all by itself; it is not controlled by environmental factors."

James S. Ferraro, an associate professor of physiology, studies circadian rhythms, the internal clock that controls sleep and other activities.

Unfortunately for humans, that clock doesn't run on a 24-hour cycle. "It's more like 25 hours," Ferraro said. "And while we use environmental stimuli, such as alarm clocks, to keep things under control, time does catch up with us."

For instance, most people will stay up late on Friday and Saturday nights and get up later on Saturday and Sunday mornings. "If we go to bed an hour later than normal on those nights, we're looking at a two-hour difference come Monday morning, hence the term 'Monday blahs.'

"Most of the time, it's not a big deal, and we recover fairly quickly," Ferarro said. But factor in another hour lost in the switch to daylight-saving time and the problem is compounded.

"Most of the time, the effects are not readily apparent," Ferraro noted. "But when you look at a larger population base, you start to notice certain trends."
For example, traffic accidents and on-the-job injuries tend to increase in the days following the time changes.

"It's not a matter of losing sleep, it's a matter of adjusting the body's internal clock," he said. "It generally takes three or four days for us to get back on track.

While most people may not notice any change or inconvenience, Ferraro notes that some of us may not feel well for a few days. "We have to re-adjust our body clocks to the social cues that are on a 24-hour cycle," he said.

Ferraro, who earned a bachelor's degree from the University of Wisconsin, Parkside, in 1980 and a doctorate in physiology from The Chicago Medical School in 1984, has conducted research to determine how light affects the circadian clock of various organisms. "Light is an environmental factor and controls daily activities to a certain degree," said Ferraro. "But what happens in the absence of light? How does an organism function when environmental stimuli aren't present?

"Light is a correctional cue -- most living things reset their clocks every day to fit with solar time."

So what is it that controls our internal clock and gives us problems with the standard 24-hour daily time frame?

"The supra-chiasmatic nuclei, cells located in the base of the brain, are what makes human beings tick," said Ferraro. "If left to our own devices, without any social cues, we would probably get up later by the da and have our daily meals on a different cycle." So while getting back on track in the days following the switch to daylight-saving time may not be easy for some, take heart. The next time change isn't until Oct. 27.

- Rod Sievers
April 3, 2002

Alaska Science Forum

March 28, 1996

Alaskans Double Their Daylight Savings

Article #1278

by Ned Rozell

This column is provided as a public service by the Geophysical Institute, University of Alaska Fairbanks, in cooperation with the UAF research community. Ned Rozell, is a science writer at the institute.

On April 7th, it's time to "spring forward" again. Time to pull the clock off the wall and watch a precious hour slip away as fast as you can turn the minute hand. We all know the ritual as daylight savings time, but in the most populated parts of Alaska it would be more appropriate to say we're going on "double daylight savings time."

That's what researchers such as Carl Benson, a Geophysical Institute professor emeritus, call it. At lower latitudes, daylight savings time brightens evenings by taking an hour of morning light and pasting it on the end of the day. This knocks Lower 48 communities an hour out of tune with the sun; the sun is highest in the sky at 1 p.m., instead of noon.

Most of Alaska gets a double dose of daylight savings. When we push our clocks ahead for the daylight savings time period---the first Sunday in April until the last Sunday in October---the sun reaches its zenith at

about 2 p.m. in Fairbanks and Anchorage. Many scientists refer to this in summer field notes as double daylight savings time because noon is two hours from where it should be. The root of the sun-sync problem was a successful lobbying job by the Alaska delegation to Congress in 1983. That's the year when three of Alaska's four time zones--Yukon, Alaska, and Bering--were combined into one. About 99 percent of Alaska's population is now synchronized to Alaska time, except for those on the westernmost string of Aleutians west of Umnak Island; clocks there are set to Hawaii-Aleutian time.

With the time-zone trimming, Juneau time became Anchorage and Fairbanks time. Before 1983, when it was 5 p.m. in Fairbanks and Anchorage, it was 7 p.m. in Juneau (Southeast Alaska was put on Pacific Time during World War II to synchronize the state capital with San Francisco and Seattle).

While the time-zone adjustment made it less complicated to call a state senator, it defeated the historic purpose of time zones--to make noon as close as possible to when the sun is at its high point in the sky.

Before time zones were established in 1883, different U.S. cities adjusted their clocks to the sun, with chaotic results. When it was noon in Boston, for example, clocks in Atlanta displayed 11:06 a.m. Expanding railroads magnified the problem. Travelers heading for a short trip west could arrive at a destination earlier than they departed, or so it seemed.

As a solution, the U.S. and Canada adopted an idea by Canadian engineer Sandford Fleming. Fleming divided the globe lengthwise into wedges, like a peeled orange. The 24 wedges each represented one

hour and 15 degrees of longitude because it takes 24 hours for the earth to complete a 360-degree spin on its axis.

The wedges became time zones. To avoid population centers, planners drew boundaries as crooked as the path of a wandering ant.

Because of Alaska's size, the state straddled four time zones: Bering, Alaska, Yukon and an unnamed zone in the far western Aleutians.

Alaska covers 57.5 degrees of longitude, almost exactly the same as the 57.6 degrees spanned between Maine and Washington.

When four Alaska time zones were transformed to two, noon didn't fit its definition in most of Alaska anymore. Daylight savings time puts the system further out of whack. In western Alaska towns such as Nome, solar noon comes at about 3 pm. after daylight savings time kicks in.

Daylight savings time was first used by the Germans in World War I to save energy. Brighter nights meant less coal was burned to light homes and businesses. The U.S., including Alaska, adopted daylight savings time in 1967. In 1972, Arizona, Hawaii, Puerto Rico and part of Indiana opted not to recognize it.

It's somewhat surprising that independent-minded Alaska hasn't followed suit. After all, we won't be burning much coal to power our lights on the sunny summer nights ahead.

Supporters of HB 176

Alaska State Public Opinion Message System:

On 3/30/2005 Robert Weber of Wasilla (Dist 14) wrote:
My 11 daughter has to get up at 530 in the morning to go to school and I would like to have some one explain to me why she has to get up an hour early starting next Monday April 4th. Alaska's the only state in the that time zone.

On 3/26/2005 Jackie Bowling of Anchorage (Dist 21) wrote:
Please vote to repeal Daylight Savings Time in Alaska. I haven't seen any good reason to keep it. The whining businessmen don't make a good case for it. How do businessmen conduct business with companies halfway around the world? Please get rid of Daylight Savings Time in Alaska. Thank you.

On 3/22/2005 Martin Spargo of Wasilla (Dist 14) wrote:
SB120/HB176. This may seem small but I could support the idea of not having to reset my clock a couple times per year I mention it only because it is currently on your agenda. Thanks!

On 3/18/2005 Michael Hansen of Chugiak (Dist 16) wrote:
and SB 120. Please support any action to eliminate daylight savings time. It's a senseless waste of time.

On 3/16/2005 Jermey Beshaw of Glennallen (Dist 12) wrote:
Time to act! Time to stop thining about it! Time to go to work!

On 3/10/2005 Susan Novak of Kenai (Dist 33) wrote:
I want to express my support for eliminating daylight savings time. As a long-time Alaskan, I know that there is no reason to have this time change in Alaska. It serves no practical purpose.

On 3/9/2005 Sara Fann of Kenai (Dist 33) wrote:
Please vote to eliminate daylight savings time. With the short winter days in Alaska, I see no benefit for the inconvenience caused by the change in time.

On 3/9/2005 Rose Scaggs of Sterling (Dist 34) wrote:
Eliminate daylight savings time. It is a nuisance trying to adjust to the change, especially when you drive a significant distance to work, you want the daylight to avoid moose. It is always worse in the morning.

On 3/9/2005 Henry Novak of Kenai (Dist 33) wrote:
Please eliminate daylight savings time as it is ridiculous in Alaska with our seasonal variations in light.

On 3/9/2005 Barbara Parker of Anchorage (Dist 23) wrote:
I urge your support of HB 176 and SB 120 that will eliminate the ludicrous daylight savings time.

On 3/7/2005 James Jordan of Anchorage (Dist 23) wrote:
and SB 120. I support these bills.

On 3/11/2005 Patricia Curtis of Anchorage (Dist 21) wrote:
I strongly urge you to eliminate Daylight Savings Time. Thanks

On 4/3/2005 Jackie Bowling of Anchorage (Dist 21) wrote:
Please get the Daylight Saving bill out of committee and to the floor for a vote. There is no good reason to have that archaic policy in effect for Alaska. Hawaii, Arizona and parts of Indiana don't have it. I think businesses there are doing okay without it.

On 4/4/2005 Joel Gaynor of Anchorage (Dist 16) wrote:
Please authorize HB 176 and SB 120. Make a big difference in quality of life for all. Alaskans now coping with time that is two hours off of the sun. Thank you.

On 4/4/2005 Mildred Memichael of Homer (Dist 35) wrote:
Please get rid of daylight savings time and also the extra hour that Sheffield put on us as we don't need it.

On 4/5/2005 Deloris Scott of Willow (Dist 15) wrote:
Please eliminate the daylight savings time and the changing of the clocks.

On 4/6/2005 Joel Gaynor of Anchorage (Dist 16) wrote:
I hope you support HB176 and SB120 and end daylight saving time. Ending DST will make a marked improvement in the lives of Alaskans. Everyone I talk to hates it, I've found nobody in favor of it. Please end DST for us now.

On 4/6/2005 Corey Williamson of Fairbanks (Dist 08) wrote:
PLEASE SUPPORT HB176 AND SB120

On 4/6/2005 June Wharam of Eagle River (Dist 32) wrote:
House Bill 176 and Senate Bill 120 have both been written to put an end to daylight saving time in Alaska. I strongly urge you to support these measures! Thank you for your consideration.

On 3/18/2005 Michael Hansen of Chugiak (Dist 16) wrote:
and SB 120. Please support any action to eliminate daylight savings time. It's a senseless waste of time.

On 3/9/2005 Barbara Parker of Anchorage (Dist 23) wrote:
I urge your support of HB 176 and SB 120 that will eliminate the ludicrous daylight savings time.

On 4/12/2005 Charles Serra of Anchorage (Dist 27) wrote:
Daylight savings time serves no purpose for Alaskans; we need morning light not late night light. Economics are not hurt six months of the year when we are one more hour from the east coast, that is a tired argument. Electronic media has changed how we do business.

On 4/9/2005 Christine Oconnor of Dillingham (Dist 37) wrote:
Please support elimination of daylight savings time in Alaska.

On 4/10/2005 Linda Plante of Anchorage (Dist 29) wrote:
Hello, Because of all the daylight in Alaska it seems irrelevant that we would really need to set our clocks back or ahead! I vote we use one time all year, Keep it simple!

On 4/10/2005 Sheryl Maney of Anchorage (Dist 29) wrote:
Please get us out of Daylight Savings Time. We don't need it here, never have. It seems pretty ridiculous up here in the land of the midnight sun to "save daylight". I vote we get rid of it NOW!

On 4/11/2005 Weaver Franklin of Anchorage (Dist 23) wrote:
Abolish daylight savings time. Demonstrate to all Alaskan's that you occasionally exercise good judgment and reason without costing a bundle of state money.

On 4/11/2005 Roger Laber of Soldotna (Dist 33) wrote:
Lobbyists are not demanding it. Gov. Murkowski hasn't requested it. It doesn't enhance taxes. It doesn't cost anything. It benefits all real Alaskans. Maybe the legislature will do something on its own and stop Alaska daylight saving time.

On 4/4/2005 Larry Ramage of Wasilla (Dist 16) wrote:
Please opt Alaska out of the daylight saving time program. What a waste of "time". This is Alaska, where are the advantages here?

On 4/9/2005 Sheila Lankford of Anchorage (Dist 28) wrote:
PLEASE eliminate daylight savings time. Email and internet availability have considerably reduced the impact to business; business is routinely conducted around the world regardless of time zone. I also represent business; I am co-owner of Montana Creek Campground. Incoming telephone calls have almost disappeared since we joined the computer world.

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April 7, 2005

House State Affairs Committee:

I would like to express my opposition to HB 176, which requests an elimination of Daylight Savings Time. Although it is inconvenient to spend a few minutes twice a year changing clocks, it is not worth the inconvenience of being two hours off Seattle half the year. Federal Statue 15 USC 260-64, time zones was established in the United States with "regard for the convenience of commerce and the existing junction points and division points of common carriers engaged in interstate commerce". The convenience of commerce has been defined to include consideration of all the impacts upon a community, which include impacts on individuals, families, businesses and other organizations.

Because of our location in the Pacific Northwest, our commerce has historically been tied to the Seattle area, which observes Pacific Time. The proposed change would mean that we would be one hour different from Seattle in the winter and two hours different in the summer. In 1983, our elected officials wanted to "unify Alaska" by combining time zones. When they proposed that most of Alaska change to Alaska Standard Time, there was a loud outcry from Southeast Alaska. We were on PST/PDT (along with Seattle), and most residents did not want to change. Votes were held in many communities in Southern Southeast and it was overwhelmingly shown that SE wanted to stay on PST/PDT. Now we are being asked to swallow being an additional hour away from the "natural" and preferred time zone for part of the year.

When most of Alaska switched to one time zone, it put the farthest east and the farthest west residents on a time zone that was not "natural" for the rhythms of the sun for either area. It was touted as a compromise to unify the state. Unfortunately, we all find it inconvenient. I suggest that we either learn to live with this compromise or switch back to the way we were before the change in 1983. If the objection is spending a few minutes changing clocks twice a year, then we could compromise by staying on Daylight Savings Time year round. I personally do not find it objectionable to switch clocks.

As a business owner, I find it very inconvenient to be 4 hours different from the East Coast. This change would mean that we would be 5 hours different for part of the year and that we would have to try to remember when the rest of the country changes. Most people can't remember now without reminders, let alone try to remember when we are no longer switching ourselves (when there would be no reminders).

As an individual, I would sorely miss that lost hour of evening daylight. It would be greatly missed in the spring and summer when the days are shorter. Please remember that SE is much farther south than your districts and our longest days are shorter than yours are. As a parent, the children would miss that hour of playtime after school. I realize that it would not make as much difference in areas outside of Southeast Alaska, but the difference would be significant here. Longitudinally speaking, SE Alaska belongs on PST/PDT. Anchorage, being farther east, belongs two hours away, just as it was.

We were all forced to compromise to join into one time zone. Now, some northern residents have found that inconvenient and want to essentially go back to the time zone that they were in before the compromise and take SE with them. Most SE residents do not like the present time zone either. If northern residents do not like the present situation, then change your situation and leave us alone.

Sincerely yours,

Paula Rak

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Volume 32, No. 9 October 2001

Sleep deprivation may be undermining teen health

Lack of sufficient sleep--a rampant problem among teens--appears to put adolescents at risk for cognitive and emotional difficulties, poor school performance, accidents and psychopathology, research suggests.

BY SIRI CARPENTER
***Monitor* staff**

On any given school day, teen-agers across the nation stumble out of bed and prepare for the day. For most, the alarm clock buzzes by 6:30 a.m., a scant seven hours after they went to bed. Many students board the school bus before 7 a.m. and are in class by 7:30.

In adults, such meager sleep allowances are known to affect day-to-day functioning in myriad ways. In adolescents, who are biologically driven to sleep longer and later than adults do, the effects of insufficient sleep are likely to be even more dramatic--so much so that some sleep experts contend that the nation's early high-school start times, increasingly common, are tantamount to abuse.

"Almost all teen-agers, as they reach puberty, become walking zombies because they are getting far too little sleep," comments Cornell University psychologist James B. Maas, PhD, one of the nation's leading sleep experts.

There can be little question that sleep deprivation has negative effects on adolescents. According to the National Highway Traffic Safety Administration, for example, drowsiness and fatigue cause more than 100,000 traffic accidents each year--and young drivers are at the wheel in more than half of these crashes.

Insufficient sleep has also been shown to cause difficulties in school, including disciplinary problems, sleepiness in class and poor concentration.

"What good does it do to try to educate teen-agers so early in the morning?" asks Maas. "You can be giving the most stimulating, interesting lectures to sleep-deprived kids early in the morning or right after lunch, when they're at their sleepiest, and the overwhelming drive to sleep replaces any chance of alertness, cognition, memory or understanding."

Recent research has also revealed an association between sleep deprivation and poorer grades. In a 1998 survey of more than 3,000 high-school students, for example, psychologists Amy R. Wolfson, PhD, of the College of the Holy Cross, and Mary A. Carskadon, PhD, of Brown University Medical School, found that students who reported that they were getting C's, D's and F's in school obtained about 25 minutes less sleep and went to bed about 40 minutes later than students who reported they were getting A's and B's.

In August, researchers at the University of Minnesota reported the results of a study of more than 7,000 high-school students whose school district had switched in 1997 from a 7:15 a.m. start time to an 8:40 a.m. start time. Compared with students whose schools maintained earlier start times, students with later starts reported getting more sleep on school nights, being less sleepy during the day, getting slightly higher grades and experiencing fewer depressive feelings and behaviors.

Also troubling are findings that adolescent sleep difficulties are often associated with psychopathologies such as depression and attention deficit hyperactivity disorder (ADHD).

This research, combined with studies showing widespread sleep deprivation among teens, has propelled efforts to educate children and adults about the importance of a good night's sleep and to persuade schools to push back high-school starting times.

"There is substantial evidence that the lack of sleep can cause accidents, imperil students' grades and lead to or exacerbate emotional problems," says U.S. Rep. Zoe Lofgren (D-Calif.), who has introduced a bill that would provide federal grants to help school districts defray the cost of pushing back school starting times. Adjusting school schedules, Lofgren says, "could do more to improve education and reduce teen accidents and crime

than many more expensive initiatives."

The research has also spurred further investigations into why teens need extra sleep, the effects of sleep deprivation on cognition, emotion regulation and psychopathology, and the long-term consequences of chronic sleep deprivation.

Dogma reversed

For decades, experts believed that people require less sleep as they move from infancy through adulthood.

It's easy to see why this belief persisted: Adolescents sleep less than they did as children, declining from an average of 10 hours a night during middle childhood to fewer than 7.5 hours by age 16. According to Wolfson and Carskadon's 1998 study, 26 percent of high school students routinely sleep less than 6.5 hours on school nights, and only 15 percent sleep 8.5 hours or more. The same study indicated that to make up for lost sleep, most teens snooze an extra couple of hours on weekend mornings--a habit that can lead to poorer-quality sleep.

But to researchers' surprise, in the past two decades studies have shown that teen-agers require considerably more sleep to perform optimally than do younger children or adults. Starting around the beginning of puberty and continuing into their early 20s, Carskadon and colleagues have shown, adolescents need about 9.2 hours of sleep each night, compared with the 7.5 to 8 hours that adults need.

In addition to needing more sleep, adolescents experience a "phase shift" during puberty, falling asleep later at night than do younger children. Researchers long assumed that this shift was driven by psychosocial factors such as social activities, academic pressures, evening jobs and television and Internet use. In the past several years, however, sleep experts have learned that biology also plays a starring role in adolescents' changing sleep patterns, says Carskadon.

Indeed, Carskadon's research is greatly responsible for that new understanding. In a pair of groundbreaking studies published in 1993 and 1997, she and colleagues found that more physically mature girls preferred activities later in

the day than did less mature girls, and that in more physically mature teens, melatonin production tapered off later than it did in less mature teens. Those findings, Carskadon says, suggest that the brain's circadian timing system--controlled mainly by melatonin--switches on later at night as pubertal development progresses.

Changes in adolescents' circadian timing system, combined with external pressures such as the need to awaken early in the morning for school, produce a potentially destructive pattern of early-morning sleepiness in teen-agers, Carskadon argues. In a laboratory study of 40 high-school students published in the journal Sleep (Vol. 21, No. 8) in 1998, she, Wolfson and colleagues examined the effect of changing school starting times from 8:25 a.m. to 7:20 a.m.

Their results were disturbing: Almost half of the students who began school at 7:20 were "pathologically sleepy" at 8:30, falling directly into REM sleep in an average of only 3.4 minutes--a pattern similar to what is seen in patients with narcolepsy.

Those findings, says Carskadon, persuaded her that "these early school start times are just abusive. These kids may be up and at school at 8:30, but I'm convinced their brains are back on the pillow at home."

Elusive questions

The evidence of adolescents' increased need for sleep and that many--if not most--teen-agers are chronically sleep deprived has raised further questions. Particularly elusive, says Carskadon, has been the question of why adolescents' circadian clocks shift to a later phase around the beginning of puberty.

One possibility, she believes, is that the brain's sensitivity to light changes during adolescence. At the annual meeting of the Associated Professional Sleep Societies in June, she and colleagues presented research showing that in the evening, exposure to even very dim lighting delayed melatonin secretion for participants who were in middle or late puberty, but not for prepubertal participants.

Carskadon is also interested in how teen-age

alcohol use might affect the brain's sleep system. Following up on studies in adults that have established a link between drinking problems and changes in sleep patterns, for example, she and her colleagues plan to examine whether during early development, young people with a family history of problem drinking might have abnormalities in the brain mechanisms that govern sleep.

Just as important as the question of why sleep patterns change during adolescence is the issue of how sleep deprivation influences adolescents' emotion regulation and behavior. Many researchers have noted that sleep-deprived teen-agers appear to be especially vulnerable to psychopathologies such as depression and ADHD, and to have difficulty controlling their emotions and impulses.

Although it's difficult to untangle cause and effect, it's likely that sleep deprivation and problems controlling impulses and emotions exacerbate one another, leading to a "negative spiral" of fatigue and sleepiness, labile emotions, poor decision-making and risky behavior, says Ronald E. Dahl, MD, a professor of psychiatry and pediatrics at the University of Pittsburgh.

Despite the evidence that insufficient sleep affects young people's thinking, emotional balance and behavior, the long-term effects of chronic sleep deprivation on learning, emotion, social relationships and health remain uncertain.

"There's a real need for longitudinal studies to follow through later childhood and adulthood," says psychologist Avi Sadeh, PhD, a sleep researcher at Tel Aviv University. Although research has amply demonstrated that sleep problems affect young people's cognitive skills, behavior and temperament in the short term, he says, "It's not at all clear to what extent these effects are long-lasting."

Researchers push for school changes, public outreach

With such a wealth of evidence about the prevalence of adolescent sleep deprivation and the risks it poses, many sleep researchers have become involved in efforts to persuade school districts to push back high-school starting times so that teens can get their needed rest.

Some schools argue that adjusting school schedules is too expensive and complicated. But others have responded positively to sleep experts' pleas. The Connecticut legislature is considering a bill that would prohibit public schools from starting before 8:30 a.m., and Massachusetts lawmakers are also weighing the issue. And Lofgren's "Zzzzz's to A's" bill, first introduced in the U.S. House of Representatives in 1998, would provide federal grants of up to $25,000 to school districts to help cover the administrative costs of adjusting school start times.

These efforts are a move in the right direction, says Wolfson. But, she says, changing school start times isn't the entire answer. "I think we have to be educating children, parents and teachers about the importance of sleep, just as we educate them about exercise, nutrition and drug and alcohol use."

Toward that end, several public-education efforts are now under way:

* With a grant from the Simmons mattress company, Cornell's Maas recently produced a film on teen-age sleep deprivation, its consequences and the "golden rules" for healthy sleep. The film is scheduled for distribution through parent-teacher associations and school principals this fall. In August, Maas also published a children's book, "Remmy and the Brain Train," which discusses why the brain requires a good night's sleep.

* Next year, the National Center for Sleep Disorders Research at the National Institutes of Health plans to release a supplemental sleep curriculum for 10th-grade biology classes, addressing the biology of sleep, the consequences of insufficient sleep and the major sleep disorders. In a related effort, the center is coordinating a sleep-education campaign aimed at 7- to 11-year-olds.

* Wolfson and colleague Christine A. Marco, PhD, a psychologist at Worcester State College, are pilot-testing an eight-week sleep curriculum for middle-school students. As part of the curriculum, students keep sleep diaries, play creative games and participate in role-playing about sleep, and set goals--for example, for the amount of sleep they want to get or for regulating their caffeine intake. Preliminary results indicate that the curriculum

helps students improve their sleep habits.

"Changing school start times is one critical measure we can take to protect young people's sleep," says Wolfson. "And then, if we can only understand what's going on with sleep in these sixth-, seventh- and eighth-graders, we can intervene to change their sleep behavior before it gets out of hand."

Click here to return to the original story

Time to get rid of daylight-saving time

Tuesday, April 2, 2002

Please support House Bill 409 by encouraging the Labor and Commerce Committee to pass this bill out of committee and onto the house floor. The committee will review this bill on March 27.

Why should Alaska reject daylight savings time?

1. Daylight-saving time serves no practical purpose to us in Alaska.

2. When we change time in Alaska we don't just move ahead or behind one hour. We move two, three or four hours away from solar time depending on where you live in our great state. Several years ago our Legislature decided to make Alaska all one time zone - that of Juneau. Here on the Kenai Peninsula this means that we are one hour off of solar time - all the time. In Nome this is two hours off of solar time - all the time. With the addition of daylight-saving time (DST) this means that from April to October when the clock reads 9 o'clock at night in Nome it's really only 6 o'clock solar time!

3. Every living organism on earth regulates its life functions to the daylight/darkness cycle. DST and Alaska Standard Time (AST) force our bodies into a clock-based cycle as opposed to a natural cycle.

4. A recent Anchorage School District pamphlet states: "The average teen gets to sleep at 11 p.m. (solar time) because of normal circadian rhythms." (This means the way the body works with the daylight/darkness cycle.) "The best, most restful sleep for teens occurs around 5 a.m." This means that from April to October, if a teen in Anchorage, Fairbanks, or Kenai gets sleepy at 11 p.m. (solar time), the clock will read 1 a.m. If the same teen gets his/her best sleep at 5 a.m (solar time) it is 7 a.m., clock time, and the teen has missed his/her most restful sleep.

5. What percentage of Alaskans need to be on Juneau time? Are our children or legislators more important?

Support HB 409 with an amendment of returning Alaska to its original time zones by contacting Lisa Murkowski, chair, Labor and Commerce at:

ERGONOMICS, 1980, VOL. 23, NO. 2, 167–178

Spring and Autumn daylight saving time changes: Studies of adjustment in sleep timings, mood, and efficiency

By TIMOTHY H. MONK

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and

LYNNE C. APLIN

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Various aspects of adjustment to Daylight Saving Time (DST) changes were investigated using two Spring and two Autumn studies. After both Spring and Autumn DST changes, although adjustment of times of retiring and falling asleep appeared to be instantaneous, waking times took up to a week to adjust. Other analyses suggested that beneficial effects on mood on awakening and perceived sleep quality might appear for much of the week after an Autumn DST change, but predominantly detrimental effects on mood after a Spring one. Performance on a calculations test at 0830 h was significantly enhanced after an Autumn DST change, though this was probably due to the enhancement in mood resulting from the change, rather than to simple lack of adjustment of the performance rhythm. Examination of individual differences in DST adjustment produced results that were consistent with those from previous studies in the shift-work and jet-lag areas, confirming the usefulness of DST changes as a vehicle for studying general problems of adjustment to changes in schedule.

1. Introduction

Circadian (about 24 h) rhythms are known to exist in a wide range of both physiological and psychological measures in man. Such rhythms are entrained by the external environment (e.g. light/dark cues etc.), but are endogenous in that they persist, even when the subject is kept in constant conditions with uniform feeding, and no sleep (Mills, Minors and Waterhouse 1978). One apparent function of such rhythms is to prepare the bodily system for the start of each new day. Suggestive evidence for this is provided by the fact that many people spontaneously wake up just before the alarm clock goes off.

Since man's circadian rhythms are endogenous, they do not adjust instantaneously to the sudden changes in schedule that are occasioned by shiftwork or transmeridian flight ('jet-lag'). The rates at which the phases of various circadian rhythms adjust to such changes have been studied quite extensively (see Aschoff, Hoffman, Pohl and Wever (1975) for a comprehensive review). In normal shiftworkers, adjustment of rhythms is seldom complete. In the 'jet-lag' area, although different variables exhibit different rates of adjustment, and the direction of travel is important (Klein, Wegmann and Hunt 1972), a rough 'rule of thumb' for physiological measures is that one day of recovery is needed for each time zone crossed.

A third possible source of circadian rhythm disruption is the change in routine that is imposed twice a year by Daylight Saving Time (DST) systems such as British Summer Time. Over 25 countries around the world now use a DST system of one kind or another, affecting over 850 million people. The entraining cues, or zeitgeber, can be divided into physical cues, such as the light/dark cycle, and social cues, such as meal times and traffic noise. After transmeridianal flight, both sets of cues encourage

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adjustment, whilst in shiftwork both are often discouraging it. DST changes lie between shiftwork and jet-lag in the degree to which adjustment is discouraged, since although social cues are predominantly encouraging adjustment, the physical cues are still timed to the 'old' system.

The study of adjustment to DST changes is important for two reasons. Firstly, in its own right, it is a condition that is imposed upon large numbers of people without the consequences being fully known. Secondly, it could provide an extremely useful and inexpensive tool for studying the importance of individual differences, such as age, sex, and personality in the adjustment of circadian rhythms to changes in schedule. Hitherto there has only been one jet-lag study involving a single sample size of more than 12, and thus able to study some of these differences properly (Colquhoun and Folkard 1978). Whilst studies of individual differences in adjustment to shiftwork are slightly more common (see review by Akerstedt and Froberg 1976), the broad variation between different studies makes overall conclusions difficult to draw. Thus, although there are important differences between DST, jet-lag and shiftwork changes, DST studies could provide useful indications of which type of people will generally find it easiest to adjust.

Possibly because adjustment would be predicted to take only a single day using the rule of thumb mentioned above, the rate of adjustment to DST changes has hitherto been largely ignored. There appear to be only two studies in the literature. The first, Monk and Folkard (1976) involved 65 subjects who rated their alertness and measured their oral temperatures at 0900 h, and recorded their time of waking, for 17 days around the Autumn 1974 DST change. The main finding of this study was a gradual adjustment in waking times lasting for most of the week after the change. The study also provided suggestive evidence for lack of immediate adjustment in oral temperature and alertness, and hinted at a possible increase in road accidents after Spring DST changes.

The second study (Nicholson and Stone 1978) reported detailed physiological sleep records of 3 subjects in the six nights around a Spring DST change. The subjects retired and were woken at the same clock times each day. Sleep onset latency was significantly increased after the change, as was the amount of Stage 4 ('deepest') sleep. Significant reductions were found in the total duration of wakefulness and in the number of awakenings.

The present studies sought to rectify the neglect that has hitherto characterised this area of research. Various aspects of DST adjustment were investigated, using two Spring and two Autumn DST studies. The four aspects will be dealt with separately in the paper, and are as follows: (i) Adjustment of sleep timings; (ii) Changes in mood on awakening; (iii) Efficiency on a calculations task at 0830 h; (iv) Individual differences in the rate of DST adjustment.

2. Method—General administration of the four DST studies

2.1. *Dates and locations*

The two pairs of DST studies to be described were carried out independently, with collaboration only taking place after all the data has been collected. For ease of reference, the letter (B) or (L) will appear after a date signifying whether it came from the Brighton or London pair of studies.

The dates of DST changes, and locations of the corresponding studies, were as follows: Autumn: 24th October 1976 (B), 23rd October 1977 (L); Spring: 20th March 1977 (B), 19th March 1978 (L). All changes took place at 0200 h on a Sunday morning.

2.2. *Design*

In both pairs of studies, the week immediately after the DST change was designated the 'test' week and the corresponding days of a week unaffected by the change (usually the one immediately before it) as the 'control' week. Saturday and Sunday readings were not taken in the London pair of studies, and in all studies most analyses will be restricted to Monday through Friday data. In the Spring, 1978 (L) study, only the first three days of the test week (Monday–Wednesday) could be used, as the Thursday of that week happened to be Maundy Thursday of the Easter holiday.

2.3. *Subjects*

Details are given in table 1. Twenty-four subjects were common to both Brighton studies, and fourteen common to both London studies. Brighton subjects were simply informed the surveys were of sleeping habits around DST changes, with no further information or hypotheses given. London subjects were not told the purpose of the studies.

3. Adjustment of sleep timings

3.1. *Introduction*

Since an hour is 'lost' by a Spring DST change, lack of adjustment of sleep timings would appear as behaviour occurring later than normal. Conversely, after an Autumn DST change, when an hour is 'gained', unadjusted behaviour would occur earlier than normal. Monk and Folkard (1976) studied the 1974 Autumn DST change and found adjustment in waking times to take up to a week. The aim of this aspect of the present studies was (i) to replicate Monk and Folkard (1976), (ii) to plot the adjustment in waking times after a Spring DST change, and (iii) to plot the adjustment in time of retiring to bed and falling asleep after both Spring and Autumn DST changes.

3.2. *Method*

In both pairs of studies, subjects were required to record their time of waking and the manner in which it occurred (e.g. alarm clock, spontaneous etc.) as soon as possible after waking up. In the Autumn 1976 (B) and Spring 1977 (B) studies, they were also required to record their time of going to bed and estimated time of falling asleep the previous night.

3.3. *Results*

Waking times from the completed records of the Autumn 1976 (B) and Autumn 1977 (L) studies were combined to give a total sample size of 73. The mean difference between 'control' and 'test' weeks for each day of the week is plotted in figure 1. Analysis of variance revealed a significant difference between 'control' and 'test' weeks ($F = 17{\cdot}3$, $df = 1,648$, $p < 0{\cdot}001$) and a significant 'weeks' × 'day of week' interaction ($F = 3{\cdot}76$, $df = 4,648$, $p < 0{\cdot}01$), thus confirming the significance of the DST effect. The results appeared to be very similar to those of Monk and Folkard (1976); the apparent overshoot on the Friday was not significant.

Waking times from the Spring 1977 (B) and Spring 1978 (L) studies could not be combined since the latter only had three 'test' days (see section 2.2). Figure 2 shows the mean difference in time of waking separately for the two studies. Analyses of variance on the five (1977) or three (1978) weekdays (i.e. omitting Saturday and Sunday readings) confirmed the significance of the difference between 'test' and 'control' weeks (Spring 1977 (B): $F = 23{\cdot}5$, $df = 1,261$, $p < 0{\cdot}001$); Spring 1978 (L): $F = 15{\cdot}1$, $df = 1,140$, $p < 0{\cdot}001$),

Table 1. Subjects taking part in the four studies.

Study	Total N	No. of males	No. of subjects with missing readings	Paid	Age range (yr)	Average age (yr)	Occupations
Autumn 1976 (B)	39	0	0	80p	19–63	32	100% University Secretaries
Spring 1977 (B)	30	0	0	80p	19–63	34	100% University Secretaries
Autumn 1977 (L)	39	19	5	No	18–79	40	51% Clerical/Professional, 20% Manual, 29% Students
Spring 1978 (L)	31	13	2	No	18–79	36	42% Clerical/Professional, 29% Manual, 29% Students

but found only slight evidence of a significant interaction between 'week' and 'day of week' (Spring 1977 (B): $F = 2{\cdot}2, df = 4,261, p < 0{\cdot}10$; Spring 1978 (L): $F = 1{\cdot}9, df = 2,140, p > 0{\cdot}10$). These tests were, however, conservative since the Sunday readings were omitted.

As one would expect from the above results, an analysis of *how* subjects awoke revealed a general increase in the number of spontaneous wakings during much of the week after the Autumn changes, and a general increase in the need for alarm clocks during much of the week after the Spring changes. In the weekdays after the Spring 1978 (B) change, the percentage of 'subject-mornings' composed of alarm wakings rose from 37% to 50% ($\chi^2 = 4{\cdot}4, df = 1, p < 0{\cdot}05$), whilst after the Autumn 1977 (B) change, the percentage of spontaneous wakings rose from 34% to 44% ($\chi^2 = 6{\cdot}0, df = 1, p < 0{\cdot}025$). Some of the changes in mean waking time observed in figures 1 and 2 can thus be accounted for by normally spontaneous wakers requiring their alarm clocks in the Spring, and those who normally needed an alarm clock, waking up before it went off, after the Autumn DST change.

No significant DST effects or interactions emerged ($F < 1{\cdot}7, p > 0{\cdot}10$ in all cases) in either time of retiring to bed or time of falling asleep, in either of the two studies in which they were recorded (Autumn 1976 (B), Spring 1977 (B)). Since these analyses included the Sunday night of the change it would appear that these measures show instantaneous adjustment to DST changes. As one would expect, this instantaneous adjustment in time of falling asleep produced sleep duration DST effects that were similar to (but not as statistically reliable as) those of waking time. Sleep durations averaged 7·2 h for a normal week night (Sunday–Thursday) and 7·8 h at weekends.

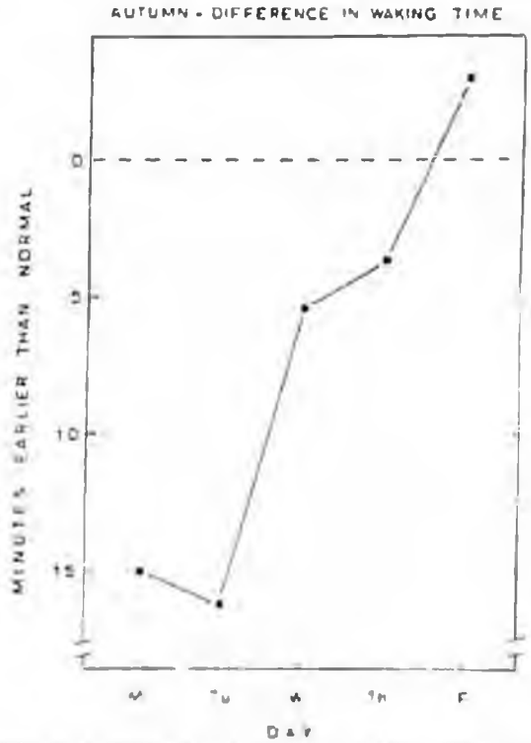

Figure 1. Mean difference in waking times between the weeks immediately before and after an Autumn DST change. The sample size was 73.

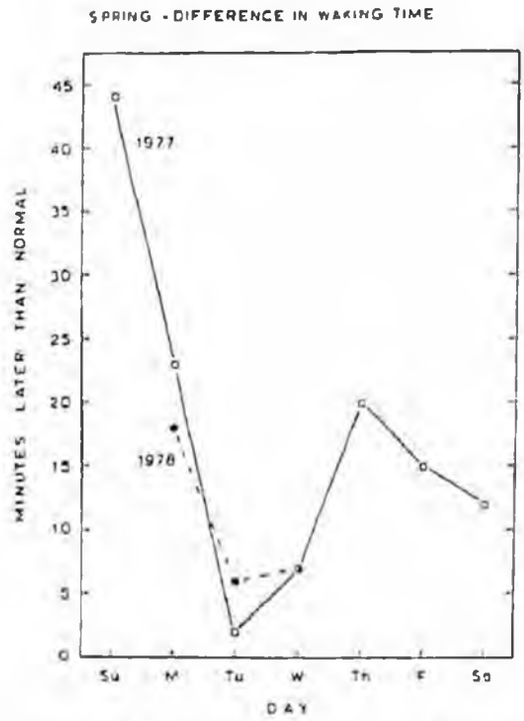

Figure 2. Mean difference in waking times between the weeks immediately before and after a Spring DST change. Sample sizes were 30 (1977) and 31 (1978).

3.4. *Discussion*

Comparison of Figure 1 with the phase adjustment curves typically found in 'jet-lag' studies (e.g. Klein *et al.* 1972) suggests that the sleep/wake cycle might simply be a rhythm gradually adjusting its phase to the new time. However, if this were the case then similar effects should be found in retiring to bed and in 'falling asleep' times. The complete lack of any significant DST effects in these measures suggests that the sleep/wake cycle should not be considered solely as a circadian rhythm. It would rather appear that these results should be interpreted as indicating a gradual phase change in an underlying physiological rhythm (e.g. of cortisol level) that is causing the organism to wake up.

This explanation would require that the pattern of adjustment of this rhythm deviate from a simple monotonic one in the Spring, where a distinct 'rebound effect' seemed to occur. Such effects have indeed been demonstrated in phase adjustment to other schedule changes. Aschoff *et al.* (1975) (p. 31) report rat body temperature data showing rebound effects occurring in response to 6 h advances, but a monotonic function for 6 h delays. This is supportive evidence since the Spring DST change represents an advance and the Autumn change a delay. Similarly, in a 'jet-lag' study, Colquhoun (1979) has demonstrated rebound effects in the temperature rhythm of human subjects experiencing an 8 h advance.

Clearly, it is important to remember that factors other than simple rhythm adjustment may have contributed to the observed results. The Spring group started the 'test' week with up to an hour of sleep lost on the Sunday morning (actually an average of 0·6 h in 1977 (B)), whereas the Autumn group gained an hour (exactly 1 h on average

in 1976(B)). Thus some of the extra sleep observed in the Spring 'test' week may have resulted from a need to make up for the deficit. However, rhythm adjustment must also have been having an effect, since by the Saturday after the change, a total of 1·2 h extra sleep had been gained. Similarly, it can be seen from Figure 1 that in the five days after the Autumn change, a total of about 0·6 h was lost. Whilst some of this 0·6 h might be the result of the .h 'excess' gained on the Sunday, the gradual pattern of the results suggests that a process of rhythm adjustment must have also been occurring.

4. Mood on awakening

4.1. *Introduction*

In a factor analytic study of various measures of mood on awakening, Herbert, Johns and Dore (1976) showed there to be two major dimensions, calmness and alertness. Visual analogue scales measuring these dimensions were used by Folkard, Monk and Lobban (1978) who found different patterns of disruption for the two measures in a group of nightworkers. The aim of the present aspect of the studies was to determine the effect of the adjustment to Spring and Autumn DST changes on these measures of mood on awakening. Measures of perceived sleep quality were also obtained.

4.2. *Method*

Each page of the sleep diary given to the Autumn 1976(B) and Spring 1977(B) subjects contained three Visual Analogue Scales (VAS). These rating scales consisted of a question, followed by a 10 cm line with the two extremes of answer at the two ends. Subjects were required to place a mark somewhere along the line to denote their answer that morning. The three questions (followed by the markings at either end of the line) were as follows:

"How well did you sleep?" (*very badly ... very well*); "On awakening how alert (i.e. quick witted, attentive and energetic) did you feel?" (*not at all ... very much*); "On awakening how calm (i.e. tranquil, contented and relaxed) did you feel?" (*not at all ... very much*).

4.3. *Results*

In each of the studies, the 14 days of readings (7 'control', 7 'test') that comprised a subject's series of scores for a particular measure were ranked from 1 (low) to 14 (high). The changes in median rank score between 'control' and 'test' weeks are illustrated in figure 3. Statistical significance was tested by the *Wilcoxon test*; both for each day separately, and for the medians of the five weekdays (Monday–Friday) taken together. Since the results of the waking time analyses would predict predominantly beneficial effects in the Autumn and the reverse in the Spring, *one-tailed tests* were used. Significant individual comparisons are marked on the figure. The only significant *weekly* comparisons occurred in the Autumn, where all three measures showed an increase between 'control' and 'test' weeks. Although these results are by no means conclusive, it would appear that people may feel more alert, calm and well-slept after an Autumn DST change, but the reverse after a Spring one.

4.4. *Discussion*

The benign effects of the Autumn change on VAS ratings may have had three possible contributory factors: (i) lack of adjustment in circadian rhythms. Since mood

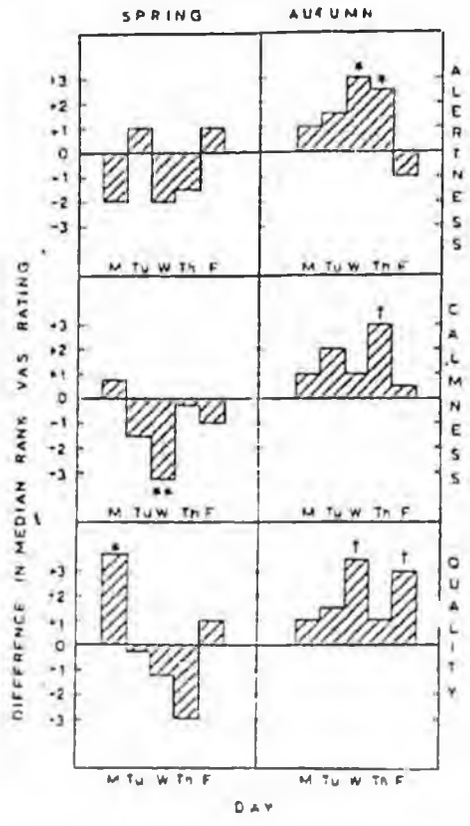

Figure 3. Changes in median rank Visual Analogue Scale (VAS) ratings between 'control' and 'test' weeks of Spring and Autumn DST changes. Bars above the zero line represent increases in alertness, calmness and perceived sleep quality respectively. Significant results were as marked: † = $p < 0{\cdot}10$, * = $p < 0{\cdot}05$, ** = $p < 0{\cdot}01$. Sample sizes were 30 (Spring) and 39 (Autumn).

ratings invariably show a rise from early to mid-morning (Folkard *et al.* 1978), any lack of adjustment after an Autumn DST change would result in 'later' mood ratings according to the old (unadjusted) rhythm, and thus an enhancement; (ii) feelings of well-being inherited from the extra sleep gained on the Sunday of the change, and (iii) feelings of well-being produced by waking spontaneously, rather than by an alarm clock. A complementary argument can be used for deleterious Spring VAS effects. The only exception is the better sleep quality rating on the morning of the Monday after the Spring change. This would seem to stem directly from the length of sleep taken (an average of 20 min longer than a normal week-night), rather than any of the three factors mentioned above.

5. Calculations efficiency at 0830 h

5.1. *Introduction*

It is now well-known that there are circadian rhythms in the efficiency with which various tasks are performed (Hockey and Colquhoun 1972). Although tasks differ in their phase (Folkard, Knauth, Monk and Rutenfranz 1976), the circadian rhythm of performance on a reasonably simple arithmetical task would be expected to show a rise

from 0830 h to 0930 h testing times. Thus any lack of adjustment of this performance rhythm after an Autumn DST change would result in an enhancement of performance at 0830 h compared with a corresponding day of the 'control' week. The present study was designed to test this prediction.

5.2. *Method*

Each subject in the Autumn 1977 (L) study was given a booklet covering each weekday in the two weeks before the DST change and the two weeks after it. For each day there was a set of three calculations: (i) addition of three 4-digit numbers, (ii) 'long multiplication' of a 4-digit number by a 2-digit number, and (iii) subtraction of one 4-digit number from another (larger) 4-digit number. The test was self-administered, the seconds hand of a clock being used to measure the total time taken to do all three calculations. Administrative problems meant that each subject was given exactly the same sequence of calculations. Thus to control for spurious effects due to practice and the particular sums given, a total of 13 naive subjects took part in a parallel study in a 4-week period during which there was no DST change. These data were then used to normalise scores from the Autumn 1977 (L) study.

5.3. *Results*

The average (normalised) score for 'control' and 'test' weeks is plotted in figure 4. Shorter than normal calculation times were apparent in the test week, and the differences were significant ($t \geq 2{\cdot}0$, $df = 33$, $p < 0{\cdot}05$, one-tailed) on the Wednesday and the Thursday.

5.4. *Discussion*

The hypothesis that performance would be enhanced during the 'test' week was indeed supported. It is, however, questionable that this enhancement can be ascribed solely to lack of rhythm adjustment, since the days on which the enhancement was significant (Wednesday and Thursday) coincided with those on which the increase in

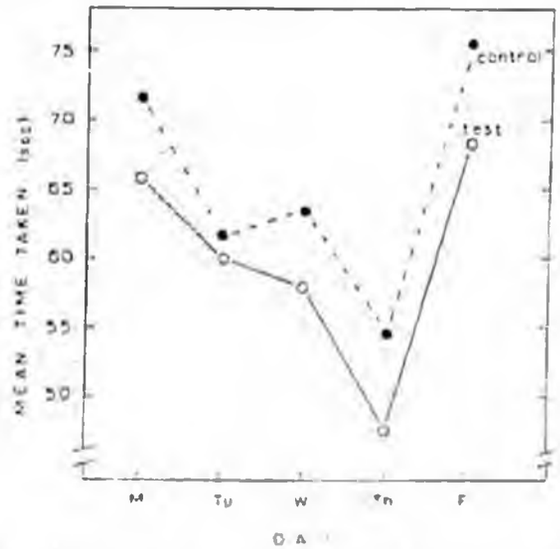

Figure 4. Mean (normalised) times taken on the calculations test for 'control' (●——●) and 'test' (○——○) weeks. The sample size was 39, but there were occasional missing readings.

VAS mood rating in the Autumn 1976(B) study was at its highest (figure 3). It would thus appear likely that the enhanced performance was more of a function of increased alertness and calmness than of lack of performance rhythm adjustment. It should be noted that the normalisation by a parallel group means that the enhancement can *not* be ascribed simply to practice.

Apart from the factors of rhythm adjustment mentioned in the Introduction, there is evidence that *any* change in the timing or duration of sleep will have an effect on performance efficiency. Taub and Berger (1976) measured performance on several tasks (including a mathematical 'additions' test) after extending and reducing sleep by 3 h, and by 3 h changes in its timing. In general, they found any deviation from normal timing or duration to be detrimental to performance. However, the order of magnitude of the individual changes in duration and timing found in the present studies (always less than 30 min) is very different from that of Taub and Berger, and it is thus not surprising that no detrimental effects were observed.

6. Individual differences

6.1. *Introduction*

DST changes differ from those resulting from shiftwork and jet-lag in that (i) they are experienced by the population as a whole, and (ii) they only occur twice per year. Consequently, there is little use for the study of individual differences in DST adjustment as a means of selecting those who might suffer the least DST disruption *per se*. If, however, results can be generalised from DST changes to the shiftwork and/or jet-lag areas, then the study of individual differences in DST adjustment could be used as a powerful and inexpensive tool for examining these more important problems, where selection can be of obvious benefit. Thus the aim of the present aspect of the studies was not just to detect types of individual who find it hard or easy to adjust to DST changes, but also to relate these results to those from the shiftwork and jet-lag areas.

6.2. *Method*

Two questionnaire tests were used, the *Eysenck Personality Inventory* (EPI) (Eysenck and Eysenck 1963) and the *Circadian Type Questionnaire* (CTQ) (Folkard, Monk and Lobban 1979). Factors such as age and sex were also considered. Scores of Extraversion and Neuroticism from the EPI were available from most of the subjects who took part in the Autumn 1974 (Monk and Folkard 1976) and Autumn 1976(B) studies. The CTQ was given to every subject in the Autumn 1976(B) and Spring 1977(B) studies, yielding three measures: rigidity of sleeping habits (R_s), 'morningness' (M) (i.e. degree to which one is a 'morning' as opposed to an 'evening' type of person), and ability to overcome drowsiness (V). These measures have been shown potentially to indicate ease of adjustment to nightwork (Folkard *et al.* 1979).

To reduce each subject's adjustment data to a single measure, a straight line was fitted by least squares to the 7 points representing the difference in waking time between 'control' and 'test' weeks in the Autumn studies. The slope of this line (D) was taken as a measure of disruption for that subject, with high values of D corresponding to increased disruption. The 'rebound effect' (see section 3.3) made a linear approximation and thus the use of D as a measure unacceptable after a Spring DST change. Consequently, for each subject in the Spring 1977(B) study, the simple difference (d) in mean waking time between 'test' and 'control' weeks was taken as the measure of disruption, with high d values indicating greater disruption.

6.3. *Results and discussion*

For the 58 subjects from the Autumn 1974 and Autumn 1976(B) studies, the measure of disruption in waking times (D) showed no significant overall correlation with their Extraversion (E) and Neuroticism (N) scores from the EPI. The results of Colquhoun and Folkard (1978) suggest, however, that such correlations will only appear for those scoring high on the neurotic scale since these authors found neurotic extraverts to suffer less than neurotic introverts from jet-lag and shiftwork disruption. The subjects were thus divided into 26 'Neurotics' ($N > 13$) and 20 'Stables' ($N < 11$). A significant correlation emerged between E and D (in the expected direction) for the 'Neurotics' ($r = -0{\cdot}44$, $df = 25$, $p < 0{\cdot}05$) but not for the 'Stables' ($r = +0{\cdot}26$, $df = 19$, $p > 0{\cdot}10$). Thus the waking behaviour of Neurotic extraverts was less disrupted than that of Neurotic introverts by an Autumn DST change, a result which parallels the shiftwork and jet-lag results of Colquhoun and Folkard (1978).

With regard to the measures of R_s, M and V from the CTQ, no significant correlations with disruption (D) emerged in the Autumn 1976(B) study. In the Spring 1977(B) study, however, a significant correlation ($r = +0{\cdot}40$, $df = 29$, $p < 0{\cdot}05$) was found between R_s and d and an almost significant correlation ($r = -0{\cdot}34$, $df = 29$, $p < 0{\cdot}10$) between V and d. Thus, as suggested in the shiftwork context by Folkard *et al.* (1979), it appears that rigid sleeping habits and a low ability to overcome drowsiness are factors connected with poor adjustment.

No significant differences between the sexes emerged in their rate of adjustment to Autumn or Spring DST changes. In the Autumn 1977 (L) study, there was significant evidence of older (> 40 yr) people adjusting faster than younger ones (< 40 yr) in waking times ($t = 2{\cdot}42$, $df = 37$, $p < 0{\cdot}05$). However, since the reverse of this trend was found in the other Autumn DST studies, it may not be reliable.

In conclusion, questionnaire tests of personality (EPI) and suitability for shiftwork (CTQ) produce results in the DST area that are in broad agreement with those from studies of shiftwork and jet-lag. Consequently, it would indeed seem feasible to use DST changes as a vehicle for studying individual differences in the general rate of adjustment of circadian rhythms.

7. Conclusions

The main conclusions of the studies are: (i) disruption in waking time lasts for up to a week after both Spring and Autumn DST changes; (ii) adjustment in time of retiring and of going to sleep is instantaneous; (iii) Autumn changes seem to be characterised by beneficial effects on ratings of sleep quality, and mood on awakening, and Spring changes by predominantly detrimental effects; (iv) calculations performance (at 08·30) is enhanced after Autumn DST changes, and (v) DST changes can successfully be used to glean information on individual differences in rate of adjustment that will generalise to the jet-lag and shiftwork settings.

Grateful thanks are due to Ms Margot Conrad for help with the Brighton studies, and to Dr M. W. Robins, Miss J. Aplin and Mr & Mrs R. Reed with the London ones. The authors are also extremely grateful to the subjects for so cheerfully and conscientiously giving up their time. The senior author would like to thank Dr Simon Folkard and Professor W. P. Colquhoun for their helpful comments on an early draft of this paper.

Divers aspects de l'ajustement aux changements saisonniers d'heure légale (DST) ont été étudiés en se basant sur les observations de deux périodes printanières et de deux périodes automnales. Après les changements d'heure du printemps et de l'automne, un ajustement instantané des moments de cessation d'activité et des moments de début d'endormissement semble s'être produit, mais les moments de réveil matinal ont mis environ une semaine pour s'ajuster. D'autres analyses ont suggéré que les effets bénéfiques sur l'humeur au réveil et sur la qualité perçue du sommeil pourraient mettre environ une semaine pour

apparaître après la DST d'Automne, mais les effets sur l'humeur seraient plutôt préjudicables après le changement d'heure du printemps. Les performances dans une épreuve arithmétique effectuée à 8.30 heures étaient significativement améliorées après le changement d'heure en automne, bien qu'il faille probablement attribuer ce fait à une amélioration de l'humeur, plutôt qu'au non-ajustement au rythme des performances. La prise en compte des différences individuelles dans l'ajustement aux DST a fourni des résultats qui sont en accord avec ceux obtenus précédemment dans le domaine du travail en équipes alternantes et dans celui des vols transméridiens, ce qui confirme l'utilité des changements d'heure, comme moyen d'investigation des problèmes liés aux ajustements à des modifications d'horaires.

Verschiedene Aspekte der Anpassung an Sommerzeit (SZ)-Wechsel wurden durch je zwei Frühlings- und Herbst-Studien untersucht. Nach beiden Frühlings-und Herbst-Sommerzeit (SZ)-Wechseln dauerte die Anpassing der Aufwachzeit bis zu einer Woche, obwohl die Anpassung an Zubettgehzeit und Einschlafen verzögerungsfrei schien. Andere Untersuchungen ließen darauf schließen, daß die Stimmung beim Aufwachen und die empfundene Schlafqualität für den größten Teil der Woche nach einem Herbst-SZ-Wechsel günstig beeinflußt wurde, jedoch überwiegend abträgliche Auswirkungen auf die Stimmung nach einem Frühlings-SZ-Wechsel auftreten konnten. Die Leistrungsfähigkeit, gemessen in einem Rechentest um 8·30 Uhr, war nach einem Herbst-SZ-Wechsel signifikant erhöht, obwohl dies wahrscheinlich eher auf die aus dem Wechsel resultierende Stimmungsbesserung als auf einen einfachen Anpassungsmangel an den Abwicklungsrhythmus zurückführen war. Die Untersuchung individueller SZ-Anpassungsunterschiede führte zu Ergebnissen, die mit früheren Studien auf dem Gebiet der Schichtarbeit und Zeitverschiebung bei Jetreisen übereinstimmen, was die Nützlichkeit des SZ-Wechsels für das Studium genereller Anpassungsprobleme an Schemawwechsel bestätigt.

References

AKERSTEDT, T., and FROBERG, J., 1976, Shift work and health—interdisciplinary aspect. In *Shift work and Health* (Ed P. G. Rentos and R. D. Shepard), US Dept of Health, Education and Welfare HEW Publication No. (NIOSH) 76–203: Washington. 179–197.

ASCHOFF, J., HOFFMANN, K., POHL, H., and WEVER, R., 1975, Re-entrainment of circadian rhythms after phase-shifts of the zeitgeber. *Chronobiologia*, 2, 23–78.

COLQUHOUN, W. P., 1979, Phase-shift in temperature rhythm after transmeridian flight, as related to preflight phase angle. *International Archives of Occupational and Environmental Health*, 42, 149–157.

COLQUHOUN, W. P., and FOLKARD, S., 1978, Personality differences in body temperature rhythm and their relation to its adjustment to night work. *Ergonomics*, 21, 811–817.

EYSENCK, H. J., and EYSENCK, S. B., 1963, *Eysenck Personality Inventory* (London: UNIVERSITY OF LONDON PRESS).

FOLKARD, S., KNAUTH, P., MONK, T. H., and RUTENFRANZ, J., 1976. The effect of memory load on the circadian variation in performance efficiency under a rapidly rotating shift system. *Ergonomics*, 19, 479–488.

FOLKARD, S., MONK, T. H., and LOBBAN, M. C., 1978, Short- and long-term adjustment of circadian rhythms in 'permanent' night nurses. *Ergonomics*, 21, 785–799.

FOLKARD, S., MONK, T. H., and LOBBAN, M. C., 1979, Towards a predictive test of adjustment to shift work. *Ergonomics*, 22, 79–91.

HERBERT, M., JOHNS, M. W., and DORE, C., 1976, Factor analysis of analogue scales measuring subjective feelings before and after sleep. *British Journal of Medical Psychology*, 49, 373–379.

HOCKEY, G. R. J., and COLQUHOUN, W. P., 1972, Diurnal variation in human performance: a review. In *Aspects of Human Efficiency: Diurnal Rhythm and Loss of Sleep* (Ed. W. P. Colquhoun) (London. ENGLISH UNIVERSITIES PRESS).

KLEIN, K. E., WEGMANN, H. M., and HUNT, B. I., 1972, Desynchronisation as a function of body temperature and performance circadian rhythm as a result of outgoing and homegoing transmendian flights. *Aerospace Medicine*, 43, 119–132.

MILLS, J. N., MINORS, D. S., and WATERHOUSE, J. M., 1978, Exogenous and endogenous influences on rhythms after sudden time shift. *Ergonomics*, 21, 755–761.

MONK, T. H., and FOLKARD, S., 1976, Adjusting to the changes to and from Daylight Saving Time. *Nature, Lond.*, 261, 688–689.

NICHOLSON, A. N., and STONE, B. M., 1978, Adaptation of sleep to British Summer Time. *Journal of Physiology*, 275, 22P–23P.

RUTENFRANZ, J., COLQUHOUN, W. P., KNAUTH, P., and GHATA, J. N., 1977, Biomedical and psychosocial aspects of shiftwork. *Scandinavian Journal of Work Environment and Health*, 3, 165–182.

TAUB, J. M., and BERGER, R. J., 1976, The effects of changing the phase and duration of sleep. *Journal of Experimental Psychology: Human Perception and Performance*, 2, 30–41.

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Louanne Christian

From: Rep. Kevin Meyer
Sent: Wednesday, March 15, 2006 8:40 AM
To: Louanne Christian
Subject: FW: Testimony in support of HB176

Please include in committee members' packets for HB 176. Thank you.

From: Ralph Bendixen [mailto:rayban@gci.net]
Sent: Wednesday, March 15, 2006 8:03 AM
To: LIO Mat-Su
Cc: Rep. Kevin Meyer; Sen. Charlie Huggins; Rep. Bill Stoltze
Subject: Testimony in support of HB176

Please accept this message as my testimony for tomorrow's hearing on HB176, a bill to exempt Alaska from daylight saving time. I am unable to appear in person or via teleconference but wish to voice my strong support of this bill. I have copied the committee chairman and my legislators to ensure that my testimony is on record.

House Bill 176 is a bill to rid Alaskans of a frustrating and pointless biannual obligation and will help to prevent the disruption of Alaskans' circadian rhythms.

Two public opinion surveys have returned results confirming that an overwhelming majority of Alaskans (Hellenthol = 49% and Dittman 58%) support abolishing this needless schedule change. I have young children who take the bus to school. When the clock changes, they are forced to wait in the dark in a very rural setting, which creates unnecessary anxiety for all of us. I work a 4/10 schedule and am forced to return to commuting in the dark every April and soon to be March through November.

Daylight saving time is a frustrating and pointless biannual disturbance of Alaskans' lives. Each spring and fall, Alaskans must go through the tedious chore of changing all clocks in our homes in order to conform to the time change. If this time change were particularly helpful to Alaskans, this expenditure of time and effort might be worth the energy involved. However, daylight saving time serves no purpose for the vast majority of Alaskans. The original rationale for daylight saving time was to maximize daylight; given the northern latitudes in which Alaskans live and the resulting darkness that persists in most of Alaska from late fall to early spring, daylight saving time is a senseless interference in Alaskans' lives.

I urge you to support HB176. Further, I urge the Senate, including my appointed representative Sen. Huggins, to hear SB120 and send this legislation to Alaska's voters so that we can voice our opinion at the polls. I intend to support the citizen's initiative that will be circulating this fall at the Alaska State Fair in Palmer and do whatever else I can to make Alaskans aware of our opportunity to do away with this unnecessary disruption of our lives. Thank you for the opportunity to share my thougts.

Ralph Ray Bendixen
17685 Butte Airman Road

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E-mail: paularak@aptalaska.net

March 13, 2006

Alaska State House of Representatives
House Finance Committee

I strongly oppose House Bill 176. It would mean that Southeast Alaska would be two hours different from Seattle in the summer and one hour different in the winter. We would also lose an hour of evening daylight. Although the proposed change would make it slightly more convenient in that we would not have to adjust twice a year, the inconvenience it would cause would not be worth the benefit.

In 1983, our elected officials wanted to "unify Alaska" by combining time zones. When they proposed that most of Alaska change to Alaska Standard Time, there was a loud outcry from Southeast Alaska. We were on PST/PDT (along with Seattle), and most residents did not want to change. Votes were held in many communities in Southern Southeast and it was overwhelming shown that SE wanted to stay on PST/PDT. Now we are being asked to swallow being an additional hour away from the "natural" and preferred time zone for part of the year.

When most of Alaska switched to one time zone, it put the farthest east and the farthest west residents on a time zone that was not "natural" for the rhythms of the sun for either area. It was touted as a compromise to unify the state. Unfortunately, we all find it inconvenient. I suggest that we either learn to live with this compromise or switch back to the way we were before the change in 1983. If the objection is switching clocks twice a year, then we could compromise by staying on Daylight Savings Time year round.

As a business owner, I find it extremely inconvenient to be 4 hours different from the East Coast. This change would mean that we would be 5 hours different for part of the year and that we would have to try to remember when the rest of the country changes. Most people cannot remember now without reminders, let alone try to remember when we are no longer switching ourselves (when there would be no reminders).

As an individual, I would sorely miss that lost hour of evening daylight. It would be greatly missed in the spring and summer when the days are shorter. SE is much farther south than central Alaska and our longest days are shorter. The children would miss an hour of playtime after school. I realize that it would not make as much difference in areas outside of Southeast Alaska, but the difference would be significant here. One must remember that SE should actually be on PST/PDT if one were to look at a map. Longitudinally speaking, SE Alaska belongs on PST/PDT. Anchorage, being farther East, belongs two hours away, just as it was.

We were all forced to compromise to join into one time zone. Now, residents of central Alaska have found that inconvenient and want to essentially go back to the time zone that they were in before the compromise and take SE with them. Those of us in SE find the present time zone inconvenient also, but would like to observe PST/PDT.

Sincerely,

Paula Rak

Paula Rak

Alaska State Legislature

Please enter into the record my testimony to the House Finance Committee
committee name

Committee on HB 176 , dated March 16, 2006
bill # / subject public hearing date

After reading the bill history of HB 176, I would like to give my perspective on the argument.

The people who oppose HB 176 speak as though changing the clock changes their ability to make money in their business. They seem to think they need an alarm clock to tell them when to get up and do business. DST does not, in fact, change anything for them. They are free to do business whenever they choose.

On the other hand, the people who support HB 176 are motivated by lifestyle changes, such as safety, health, and the well-being of children and the elderly, as well as privacy and common sense. When we are forced to function in a different time frame twice a year, we are sacrificing our health and convenience for the sake of those who wish to profit at our expense.

The craziest part is those who complain about being 4 or 5 hours from the east coast. If that bothers them, why do they continue to live here? Look at a map! We are a long way from New York City; it is a fact of life.

Finally, changing to pacific standard time or staying in daylight saving time is NOT a solution of any kind. Again, look at a map. The goal should be for our clocks to be as close to normal time as possible, dictated by the sun.

Mr. V[illegible]nd Mr. Salmon are talking sense; I fully support their efforts. Please work together to deliver Alaska from the tyranny of clock changing. If it has to go to an advisory vote, so be it, but keep it simple: Do you wish to be free from daylight saving time?

Thank you, Teresa Danielson

Signed: [signature]
Testifier

Self
Representing (optional)

PO Box 1322 Sterling, Ak 99672
Address

262-7761
Phone number

March 16, 2006

To: House State Affairs Committee
Sponsors: Representatives SALMON, Kohring, Croft, Gruenberg

Re: Comments to Bill No. 176(STA)

To Whom It May Concern:

My name is Ron Merritt. I have lived in Wrangell about 40 years. Getting off daylight savings time would be a great idea. In Alaska it works in the opposite fashion that it should. When we go off it in the fall and winter, we lose an hour of daylight in the evening prolonging an already long, long, night. When we go on it in the spring, we gain an extra hour of daylight at night, which at that time of year, due to the long daylight hours, we certainly do not need.

Ron Merritt

Ron Merritt

Wrangell, AK