Promoting UV Exposure awareness with Persuasive, Wearable Technologies

Sazzad Hussain, Liam Cripwell, Shlomo Berkovsky, Jill Freyne
Today: Partly cloudy today. It's currently 10°, the high will be 11°.

Sunrise: 7:24 AM
Sunset: 5:29 PM

Chance of Rain: 0%
Humidity: 100%
Wind: wsw 21 km/hr
Feels Like: 10°
Precipitation: 0.0 cm
Pressure: 1,013 hPa
Visibility: 9.7 km

UV Index: 1

Today - Mostly cloudy with a high of 11 °F (10.6 °C). Winds variable at 11 to 14 mph (17.7 to 22.5 kph).

Tonight - Mostly cloudy. Winds variable at 9 to 11 mph (14.5 to 17.7 kph). The overnight low will be 47 °F (8.3 °C).
UV Radiation and Sunburn

• The Sun’s UV radiation can cause sunburn,
  ✓ Damages skin cells, leading to the development of cancer.

• The World Health Organization (WHO) estimates that each year,
  ✓ 2 to 3 million non-melanoma skin cancers and 132,000 melanoma skin cancers occur worldwide.

• The problem is particularly acute in Australia,
  ✓ Has highest rate of skin cancer in the world.
  ✓ More than 434,000 people are treated for non-melanoma skin cancer each year.
  ✓ 12,000 cases diagnosed with melanoma in 2012 and 2,200 incidents of death in 2013.
  ✓ Two in three Australians will be diagnosed with skin cancer by the age of 70.
Benefits of Sunlight

• Sun exposure impacts human biological processes in POSITIVE ways as well.

• The WHO reports a greater annual disease burden worldwide is likely due to lack of adequate sun exposure.

• Moderate exposure to the UV radiation is essential for vitamin D production,
  ✓ Lack of UV exposure can pose risk of osteoporosis and other chronic disease from vitamin D deficiency, certain types of cancer, and even psychological disorders.
  ✓ Vitamin D insufficiency and deficiency is a prevalent condition in Australia.

• Sunlight in general plays an important role in the regulation of sleep-wake cycles,
  ✓ Impact mood, cognitive function, and overall wellbeing.
Sunlight

Sunlight = Bright Light + UV Light

Mood
Cognitive functioning
Sleep-wake cycle

Vitamin D
Sunburn
Skin cancer

Images: sunsprite.com
Recommended sun protection scheme with simple “sound bite” messages (Source: WHO)

- Low (1,2): No protection required. You can safely stay outside!
- Moderate (3,4,5): Protection required. Seek shade during midday hours! Slip on a shirt, slop on sunscreen and slap on a hat!
- High (6,7): Extra protection. Avoid being outside during midday hours! Make sure you seek shade! Shirt, sunscreen and hat are a must!
- Very high (8,9,10): Extreme (11+):
Personal Factors

- UV affects people of different skin tones differently.
  - Specifically in terms of physiological effects and risk of sunburn.

- The Fitzpatrick questionnaire has been shown to reliably classify a person’s skin type.
  - Ten questions, each with a scale of 0-4
  - Eye/hair/skin colour, freckles, sun exposure effect on skin, tanning behaviour.

Image: arpansa.gov.au
Wearables and Personalisation
Wearable Tech: SunSprite

Tracks light exposure and help get the right amount each day.

- Bright Light
- Seasonal Depression
- UV light
- Vitamin D

Images: sunsprite.com, App Store (GoodLux Technology)
Skin Type, Minimal Erythemal Dose (MED), Time to Burn

[SF * Time to burn]

Source: davisnet.com
Persuasion with personalisation
(Proposed Technology Solution)
Proposed Technology Solution

- UV sensor
- Ambient light sensor
- Text notification display

- UV: 4.7
  - Status: "You are in DANGER"
  - Message: "You are in DANGER. You have reached your recommended Vitamin D intake and are now in danger of sunburn."

- UV: 4.7
  - Status: "You are SAFE"
  - Message: "Time until risk... 25 minutes"

- Vitamin D
  - Status: "You are SAFE"
  - Message: "Time until risk... 25 minutes"

- UV sensor
  - Message: "Uh OH! You have reached dangerous levels of exposure. Head indoors or apply sunscreen immediately."

- Ambient light sensor
  - Message: "You are SAFE. Time until risk... 25 minutes"
Persuasion with visualisations

Sleep duration

Sun exposure
Summary

• Prototype of a personalised technology platform for promoting healthy and safe sun exposure behaviour.
  - Tailored information and visualisation, based on environment sensors and personal profiling.

• Our work-in-progress Android app uses the Microsoft Band to sense UV and light.
  • Can easily adapt to other commercial wearable devices on the market or in development through SDKs.
“prevention is better than cure”

- Widest target group is the general population that are seeking to avoid sunburn,
  - Outdoor enthusiasts, construction workers, gardeners, traffic wardens, parks/wildlife staff.

- Other target group is those who spend large amounts of time indoors,
  - Office workers, elderly population.

- Reduce the burden of disease in Australia and worldwide.
Future Work and User Evaluation Plans

• Testing accuracy of sensors and algorithms

• Feasibility

• User acceptance

• Usability
Thank you

Sazzad Hussain
Phone: +61 2 9372 4177
Email: sazzad.hussain@csiro.au
References


