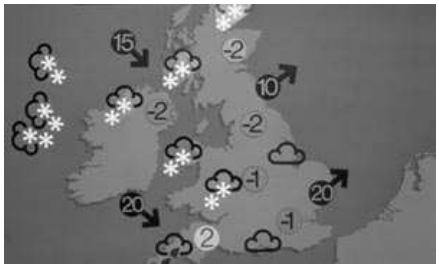
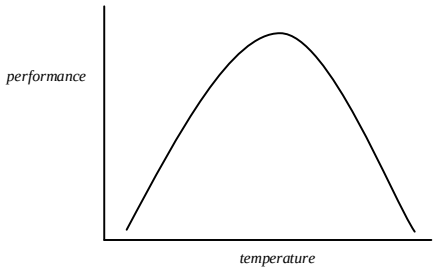
Weather and Performance



The relationship between temperature and performance on many cognitive tasks appears to be curvilinear. As temperature increases, performance improves, but only up to a point. If temperature continues to rise beyond the optimum level, performance starts to decline. If this trend is plotted on a graph, a characteristic inverted U shape is seen.



So, in general, extremes of heat and cold are detrimental to performance and for most types of task there appears to be a optimum temperature range where performance is superior.

Extremes of Heat

Laboratory studies have indicated that at temperatures above 30°C there is a marked decline in performance on a variety of tasks. These include tracking and vigilance. Tracking involves following a target, a component of skills like driving. Vigilance involves the detection of intermittently appearing targets on a screen (Matthews et al, 2000). Other research has linked extremes of heat to reduced visual acuity, poorer attentional ability and a general decline on cognitive functioning (Cassidy, 1997). Abilities of this type are demonstrably affected in real-world situations, too. This is shown in a study by Wyon et al (1996) in which participants drove a car along a pre-arranged route through a city. A computer inside the car was set to trigger a series of unexpected events (e.g. altering the speedometer or the clock) to which participants had to respond by pressing a foot switch. Participants undertook this task at either 21°C or 27°C. The results showed that performance was impaired at higher temperatures. At 27°C participants missed 50 per cent more of the unexpected events and took significantly longer to respond to those that they noticed. Research like Wyon's and colleagues', which is high in **ecological validity**, illustrates the impact that weather conditions can have on a commonly performed tasks like driving, in which mistakes can result in injury or death. As Wyon et al observe, the performance deficits they observed at 27°C would add 88m to the stopping distance of a car travelling at 60 kmh^{-1}. They suggest that this illustrates the practical value of fitting air conditioning to car that will be used in hot climates.

Extremes of Cold

As previously stated, extremes of cold are also associated with a decline in performance. This is partially because of the effect that cold has on manual dexterity. For example, at skin temperatures below about 20°C there is a marked decline in ability to perform even simple tasks like tapping on a surface. At a skin temperature of 16°C the hands become painful and at around 6°C there is a loss of sensation (Heus et al, 1995; Enander, 1984). Effects such as these will obviously influence a person's ability to use their hands effectively. Some research has indicated that extremes of cold can affect performance on cognitive tasks such as tracking and vigilance, but it is not clear whether this is the result of a cold induced cognitive deficit or if it simply reflects movement difficulties in performing the task (Matthews et al, 2000).

Other Weather Effects

Of course, temperature is only one aspect of climate and weather. Two other aspects have been suggested to influence psychological functioning are **ion concentration** and **atmospheric pressure**. An ion is particle that carries a charge, which may be positive or negative. Regarding ion concentration, the atmosphere generally contains roughly equal number of positive and negative ions. However, prolonged warm, dry weather may lead to an excess of positive ions and rainstorms may lead to an excess of negative ions. Baron (1987) has suggested that changes in ion balance may affect behaviour. For example, San-Gil-Martin et al (1988) found an association between changes in ion concentration and psychiatric symptoms. However, the evidence has been rather mixed and it would be premature to draw any firm conclusions at this point (Cassidy, 1997).

An alternate line of enquiry concerns the effects that variations in atmospheric pressure may have on performance. It has been suggested that, under certain conditions, atmospheric pressure may fluctuate in a regular way to produce oscillations in atmospheric pressure that are akin to very low frequency sound waves. Research by Delyukov and Didyk (1999) has indicated that, when exposed to certain types of artificially induced OAPs, participants show measurable deficits in tasks involving attention and working memory. However, this represents one isolated finding and it is not clear the extent to which the artificial oscillations produced by Delyukov and Didyk actually occur in nature. Therefore, it is not possible to state with certainty that atmospheric pressure changes affect psychological functioning, although it remains an intriguing possibility.

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