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The effect of alcohol upon response to fire alarm signals in sleeping young adults

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Fire fatality statistics compiled throughout the United States and Australia clearly show that being asleep in a residential home is a serious risk factor for death resulting from a fire[1,2,3,4.] However the likelihood of death occurring is affected by more than simply time and place. Analysis of the characteristics of both victims and survivors reveal that age is a significant risk factor, with the likelihood of fatality increased for both the very young, and the very old.[1,2,3]

Under benign circumstances, unimpaired adults aged 18 to 64 respond well to smoke alarm signals, and are at a comparatively low risk for death. However, alcohol ingestion greatly increases fire fatality risk across all age groups. In a study of residential fire deaths in Japan, Sekizawa [5] reports that 53.1% of all fatalities were asleep and/or drunk, and that over 65% of victims aged between 6 and 64 were under the influence of alcohol. Other studies conducted across several continents have reported similar findings. [4, 6] The combination of smoking and drinking seems to particularly elevate risk due to an increased opportunity for fire ignition. In fact, the majority of smoking-related fire fatalities show some direct connection with alcohol consumption.[7,8]

Presence of alcohol in the system has been found to elevate the risk factor for death for those who would usually be least vulnerable, that is those aged between 18 and 64, to the extent that it matches the risk factor for the most vulnerable age groups.[9] Furthermore, alcohol intoxication has also contributed to the number of child deaths. In their study examining the characteristics of victims and survivors of residential fires during a one year period in North Carolina, Marshall and colleagues[10] report that surviving carers were affected by alcohol in 15% of juvenile deaths. Most importantly, alcohol intoxication has been found to greatly increase the probability of death from fire across *all* age groups to the extent that it has emerged as the *single most important risk factor*.[4]

The increased mortality rate for those who have been drinking is a very important issue for young adults, who are perhaps less experienced drinkers than their older counterparts, and whose lifestyle traditionally provides more opportunities for partying, but who also have more deep sleep. This has been tragically highlighted in a number of campus accommodation fire deaths in the USA where alcohol use was implicated[11]. A recent survey undertaken by the Salvation Army in Australia reports that binge drinking in young adults is becoming a rapidly increasing problem for society, with 35% of teenage males, and 22% of teenage females admitting to binge drinking on occasions[24]. Given the relationship between alcohol intoxication and elevated risk for mortality in a fire, this group are engaging in behaviour that leaves them very vulnerable.

Many explanations have been offered for the increased mortality risk for those under the influence of alcohol. The physiological effects of alcohol are well documented, and it is has been suggested that these effects may elevate the risk of injury or death in the following ways:

- Failure to hear alarm
- Failure to correctly interpret alarm
- Inappropriate response, such as a failure to avoid a dangerous pathway
- Poor motor functioning, e.g. poor balance and coordination
- Recovery rate from burns is significantly worse for alcoholics, meaning that they may suffer death from more minor injuries than non-alcoholics.

Although many hypotheses have been put forward to explain the elevated mortality rate when alcohol is involved, no previous systematic research has been undertaken to investigate whether this is due to victims' failure to awaken to their smoke alarm, or whether they awaken but are too impaired to take the appropriate steps to save themselves. This is a vitally important question for fire safety research because both possibilities have very different implications. Alarm signals are designed to alert individuals to the possibility of threat with sufficient time to take action. The outlook for avoiding injury or death is therefore substantially worse for a person who is not awakened by their alarm because they will be denied the opportunity to do so, unless something or someone else alerts them in time.

Since time to evacuation is a critical element for survival in a fire, the time taken to awaken and respond to a smoke detector alarm signal is an important consideration from a fire safety perspective. But is a beeping alarm signal a sufficiently effective stimulus? It is well established that sleeping individuals are able to discriminate between different auditory stimuli when asleep[12,13,14,15,16] and it is purported that they respond best to signals that have an emotional significance, for example their own name[16]. If speed and reliability of arousal are important factors, perhaps a beeping signal is not the most appropriate sound to use when alerting sleeping individuals to the possibility of a fire, as an electronically generated beep may not be perceived as of emotional significance. In fact, when beeping alarms are heard, it has been found that many people are unlikely to recognise the sound as a fire alarm.[12,17] It has been suggested that the salience of beeping alarm signals is diminishing in the context of modern life.[18] An alternative that has been explored in alarms with industrial application is a signal that uses a human voice. The advantage of voice alarms is that they directly convey their meaning through the words spoken.

The aim of the current study was to explore the arousal threshold of deep sleeping young adults in the deepest stage of sleep (Stage 4), to three different alarm signals including a Female Voice alarm, the rapid paced high pitch beeping smoke alarm signal currently compulsory in Australian homes and the Temporal-Three (T-3) beeping alarm that has been adopted as the International Standard evacuation signal (ISO 8201). Most importantly, the research also aimed to explore the arousal threshold to these signals in three different alcohol conditions; sober, .05 blood alcohol concentration (BAC), and .08 BAC.

It was hypothesised that participants would respond to the Female Voice alarm at the lowest volume, and in the fastest time, but that no significant difference in the response patterns to the two beeping signals would be found. It was also hypothesised that for all signals, participants would respond at the lowest volume and with the most speed when they were sober, followed by .05 BAC, and then .08 BAC.

METHOD

Participants

Participants were recruited through advertising targeting the student population of Victoria University. The advertising called for self-reported deep sleeping persons aged between 18 and 25 years who also reported occasionally using alcohol. Non-drinkers were excluded from the study, as were those who reported any hearing difficulties, sleep disorders or neurological conditions that may have affected their ability to perceive or respond to an auditory signal.

As a result of announcements made at lectures and through the posting of fliers on student notice boards, 12 young adults (7 male, 5 female) were recruited from amongst the student body, and their friends and family. Ages of participants ranged from 18 to 25 years (mean = 20.92, sd = 2.28) and they were paid $50.00 AUD for each night of testing.

Materials

Participants were tested in their own homes using the Compumedics Siesta wireless polygraphic data acquisition system. The EEG was monitored using the Profusions PSG programme on a notebook computer from a room adjacent to the participant's bedroom. An automated sound delivery system specifically developed for this project to initiate and control the alarm sounds was also operated from the notebook computer. Sounds were played from stereo speakers placed on a portable table in the participant's bedroom, and attached to the notebook computer by way of a ten metre extension cord. A button which illuminated a small blue light was placed near the bed within easy reach of the participants when awoken from sleep. A ten metre extension cord attached this button to a corresponding small blue light placed next to the research assistant. A Lutron SL-4001 Sound Level Meter was used to measure sound intensity.

The alcohol administered was Smirnoff vodka (37.5 % alcohol volume). This was mixed with reconstituted orange or cranberry juice, according to participant preference. A Lion Alcometre S-D2 breathalyser was loaned from the Victoria Police to measure blood alcohol content (BAC). This unit was recalibrated every 3 months to ensure accuracy of measurement.

The effectiveness of the following three sounds was compared:

Female Voice

A human voice alarm was developed specifically for the current study (see Bruck and Ball in this volume for details of the design specifications and rationale). This signal consisted of a female actor's voice that warned of danger due to fire in an emotional tone, and said that the person must wake up and investigate.

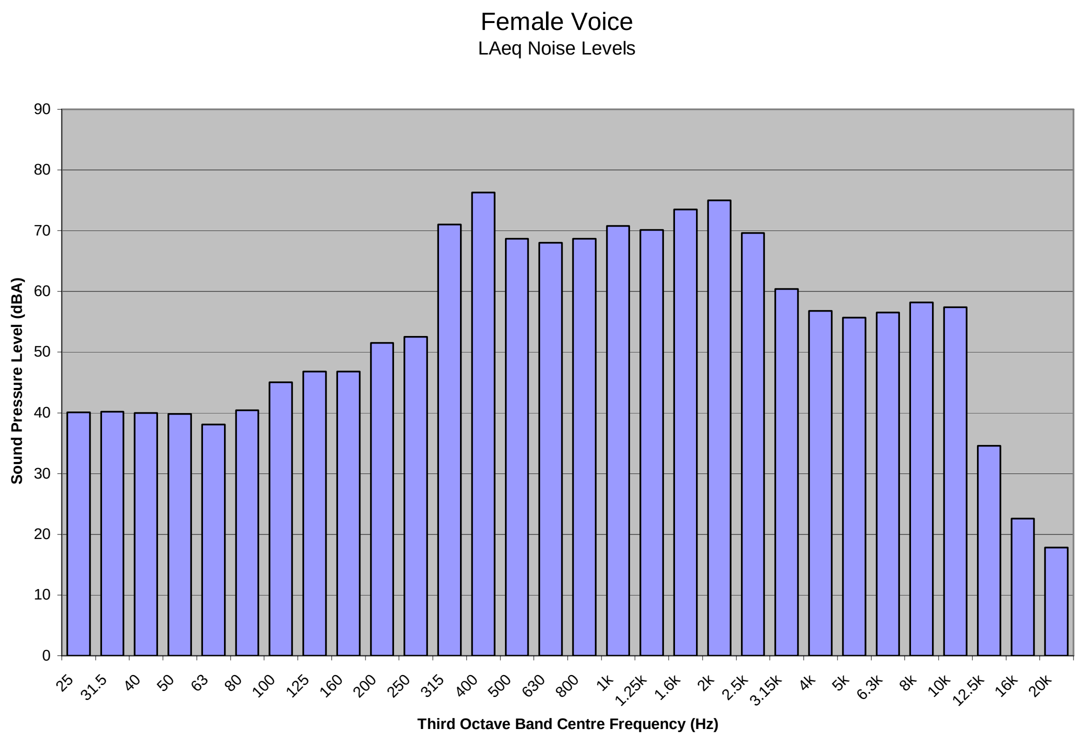
Australian Standard Alarm (ASA)

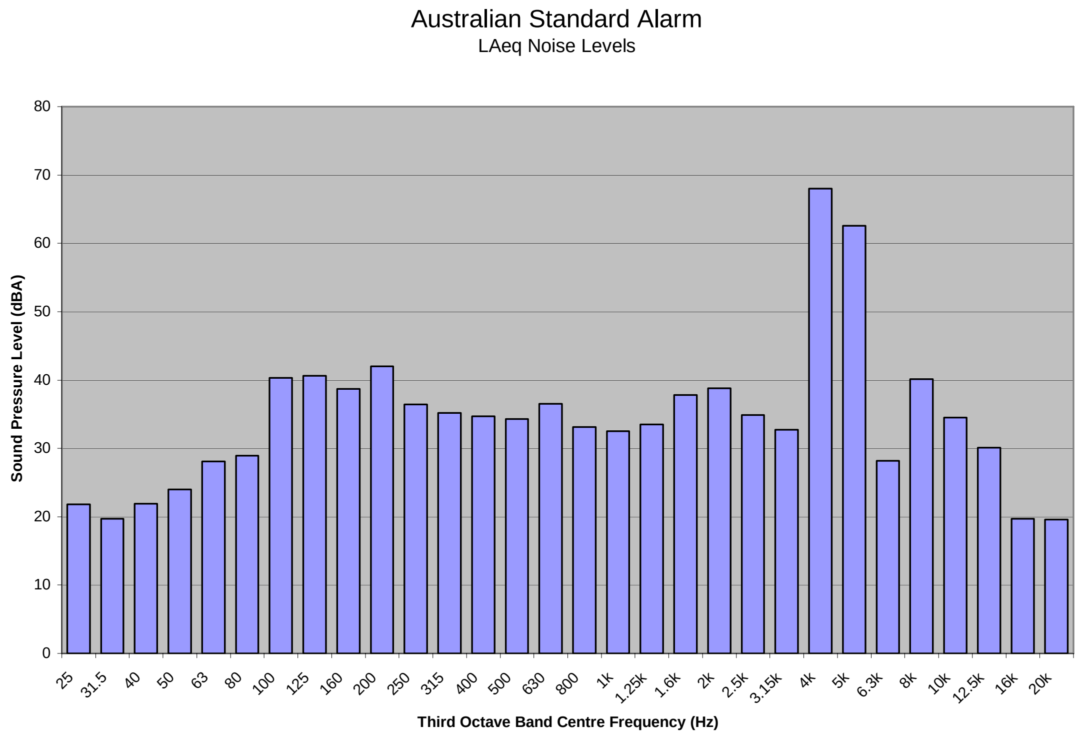
The modulating high frequency beeping alarm signal that is used in the manufacture of residential smoke alarms in Australia.

Temporal-Three Evacuation Signal

A lower frequency alarm signal that sounds the Temporal-Three (T-3) pattern as laid down in International Standard 8201. This sound was sourced directly from the study undertaken by Proulx & Laroche in 2003.[17]

Graphs showing the parameters of the pitch of the sounds are shown in Figure 1. Please note that all sounds were measured in a room with background noise level at about 50dBA. Sounds were played at a level above this, and therefore are described in the graphs according to peaks occurring above 60dBA.





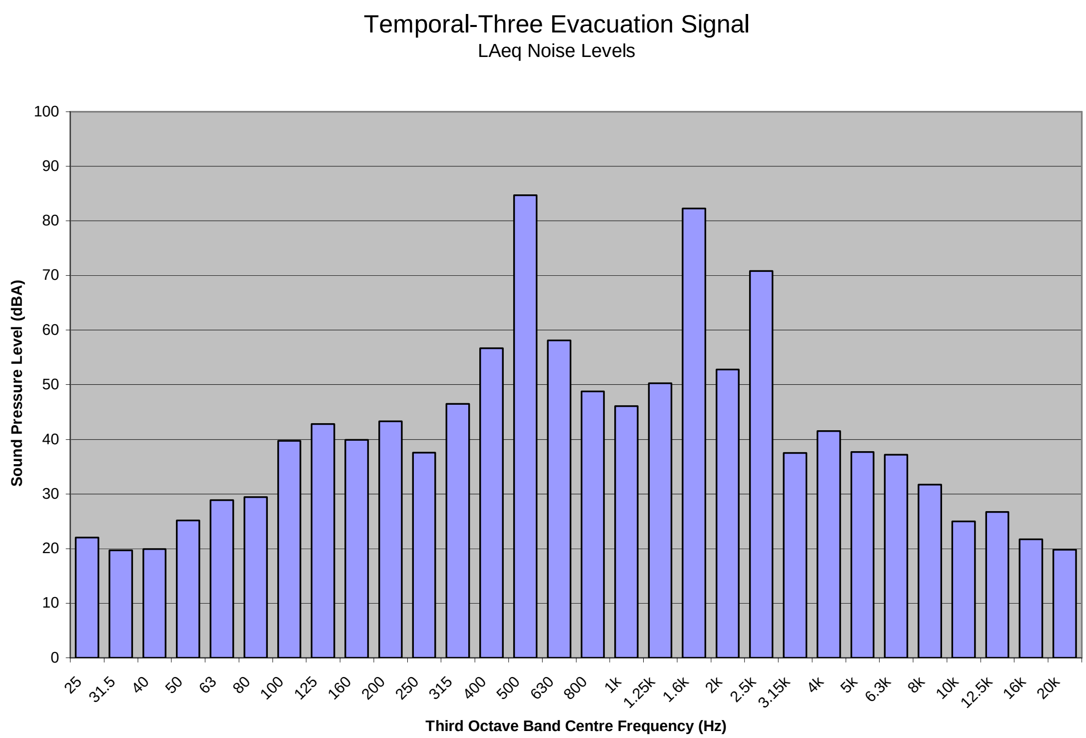


Figure 1. Pitch parameters of the alarm signals.

Figure 1 shows the Female Voice to be a complex sound with dominant tones in the 315Hz to 2500Hz range. Specific peaks can be seen at 400Hz, 1600Hz, and 2000Hz.

Conversely, the Australian Standard Alarm is revealed as a reasonably pure tone, with specific peaks at 4000Hz and 5000Hz. Similar to the Female Voice, the T-3 is a moderately complex tone, with specific peaks at 500Hz, 1600Hz, and 2500Hz.

Procedure

Data collection was undertaken by the first author (MB) and three research assistants who were Honours or Post Graduate students from the Victoria University School of Psychology at their time of employment.

Testing was carried out in participants' homes while they were sleeping in their own beds in order to provide an environment that was as close as possible to a 'real world' situation. Speakers were positioned at a distance of at least one metre from the participant's pillow, and at no more than 2 metres. The speakers were joined together with a steel band to ensure their configuration would be standard in all rooms. They were permanently positioned with one speaker placed either side of the sub-woofer. Sound was calibrated at the participant's pillow at the level of 60dBA. The 60dBA T-3 sound was played continuously until the desired sound intensity was achieved by adjusting speaker volume so that the sound level meter displayed 60dBA (+/-3dBA).

The behavioural response light was positioned on the bedside table where possible, or in a position that could easily be reached by the participant when in bed.

The participant was asked to be changed for bed prior to electrodes being put in place. Electrodes were attached according to the standard placement set down by Rechtschaffen & Kales.[19] Electroencephalogram (EEG) electrodes were attached at C3, C4, A1 and A2. Electro-oculogram (EOG) electrodes were placed at approximately 1cm above the outer canthus of the eye on one side, and at approximately 1cm below the outer canthus of the other eye, and electromyogram (EMG) electrodes were placed beneath the chin. Additionally, a reference electrode was affixed to the middle of the forehead, and a ground electrode was located at the collarbone. Before electrodes were attached, the skin was cleaned firstly with an alcohol swab, and then with Nuprep abrasive cream. Gold cup electrodes were used for C3 and C4, and minidot snap- on electrodes were used for all others.

Testing occurred over three nights, usually one week apart, but always with a minimum of three intervening nights to allow for adequate sleep recovery. The first night of testing was always the sober condition. Alcohol was administered on the remaining two nights at .05 BAC, and .08 BAC in a counterbalanced order across participants. A tolerance level of plus or minus .01 BAC was allowed at any given level.

All sounds were played to participants prior to them going to bed on the first night. This was done because a level of familiarity was assumed with the current modulating alarm signal used in Australian homes, and it was thought that prior exposure to the new signals may minimize the impact that any novelty might have upon the speed of awakening. On subsequent nights participants were informed that they would be hearing the same sounds as the last time. Sounds were presented in counterbalanced order across participants. All three signals were presented on each night to each participant.

When alcohol was administered, drinks were mixed immediately upon arrival at the participant's home in order to allow for alcohol to be properly absorbed before bedtime. One standard drink for the current study was 60ml, comprising 30ml of vodka, and 30ml of juice. Both drinks were chilled to avoid the standard dose being diluted by ice. Depending upon the alcohol level required on any given night an estimate of the number of drinks required to achieve the appropriate level was made in consultation with the participant. This estimate was based upon participant height, weight, time since last meal and the constituents and size of this meal, as well as the participant's own estimate based on their usual alcohol tolerance and how they were feeling at the time. Estimates were deliberately conservative to avoid overshooting the required level, and participants were instructed to drink at their own pace, and especially to avoid drinking too fast for their own welfare. Blood alcohol concentration was measured using the breathalyzer ten minutes after the estimated amount of alcohol was completely consumed. If the reading was too low, more alcohol was administered, and the BAC re-tested using a clean straw a further ten minutes after this was consumed. There was no instance when the reading was too high.

Once the required alcohol level was reached and the electrodes were in place, the participant went to bed. Prior to lights out they were instructed on the procedure to follow when they became aware of the signals sounding. They were asked to depress the behavioural response button placed next to their bed three times to signify that they were awake as soon as possible after they became aware of the sounds playing. After lights were extinguished, the research assistant monitored the participant's EEG until Stage 4 sleep was confirmed for a minimum of three consecutive 30 second epochs according to the criteria laid out by Rechtschaffen & Kales.[19] Once stage 4 sleep was confirmed the sound delivery system was activated to commence signal delivery through the speakers in the bedroom. All sounds were presented using the 'method of limits' whereby a signal is presented at a low intensity, and then incrementally increased across a predetermined time limit until the participant responds. Sounds were commenced at 35 dBA, which corresponds generally to the sound intensity of a whisper, and the volume was increased in 5 dBA increments up to a maximum level of 95 dBA, which is equivalent to loud industrial noise. The sounds played continuously for 30 seconds at each volume level to allow participants enough time to respond at any given intensity. When a participant responded by depressing the behavioural response button, the research assistant alerted the sound delivery programme to record the exact time, and the sound was ceased. If there was no response after 30 seconds at 95dBA, the sound continued for a further 3 minutes before being terminated. All behavioural response times were calculated as number of seconds from sound commencement. If a participant failed to respond at all, awakening was recorded as taking 600 seconds (30 seconds longer than the actual total time from sound commencement to termination). For sound intensity level, responses in the first 30 second period at 95dBA was recorded as 95dBA, responses in the second period of 30 seconds at 95dBA as 96 dBA, and so on, up to 101dBA for awakening in the final (7^{th}) period at 95dBA. Non-awakening was recorded as 105 dBA (10 dBA higher than the maximum level).

RESULTS

Data were pooled and statistical analyses performed using SPSS Version 11. Statistics describing the pattern of responses according to sound intensity level were calculated.

Table 1.
Descriptive statistics of sound intensity level (dBA) according to sound type and alcohol level (N = 12).

	ALCOHOL					
SOUND	**Sober**		**.05**		**.08**	
	Mean	Median	Mean	Median	Mean	Median

Female Voice	59.58 (14.06)	60.00	79.33 (22.87)	82.50	80.50 (20.99)	82.50
Australian Standard Alarm	72.50 (17.77)	72.50	85.00 (12.76)	82.50	87.50 (15.89)	92.50
T3 Alarm	59.17 (15.64)	65.00	78.25 (17.90)	80.00	82.92 (19.59)	80.00

*Standard deviations are presented in brackets below the means

These results demonstrate that response to the both the Female Voice and the T-3 were very closely matched, and both aroused individuals at a sound intensity that was usually lower than the Australian Standard Alarm (ASA) signal. Table 2 also shows the substantial increase in magnitude required for all signals when alcohol was administered.

The data presented in Table 1 does not fully capture the finer details of differences in response patterns at the highest sound intensity level. The following table outlines the pattern of response when the sound intensity reached 95dBA, or when participants slept through.

Table 2.
Frequency of response patterns at high sound intensity where each number in the table indicates how many participants awoke (n = 12).

	Sober			.05 BAC			.08 BAC		
	Voice	ASA	T-3	Voice	ASA	T-3	Voice	ASA	T-3
Within 2 mins	0	1	0	1	3	1	1	2	1
Within 4 mins	0	0	0	2	1	1	1	2	0
Slept through	0	1	0	2	1	1	2	2	4
Total	0	2	0	5	5	3	4	6	5

Regardless of signal, at.05 BAC, 13 of 36 (36.11%) trials resulted in no response before 95dBA or no response at all.. This was increased to 15 of 36 (41.67%) trials when the BAC was increased to .08. It should also be noted that the Female Voice and T-3 did not reach 95dBA for any participant in the sober condition. Maximum sound intensity levels required to produce a response for these signals in the sober condition was 80dBA and 90dBA respectively.

Means and standard deviations for behavioural response times (measured in seconds) were calculated and are shown in Table3.

Table 3.
Mean behavioural response time (seconds) according to sound and alcohol level (n = 12).

	ALCOHOL					
SOUND	Sober		.05		.08	
	Mean	SD	Mean	SD	Mean	SD
Female Voice	161.75	80.50	336.00	199.93	330.17	176.52
ASA	252.33	140.66	336.83	119.59	380.67	153.91
T3 Alarm	158.25	90.63	299.92	146.56	351.58	195.38

Perusal of the overall sample means shows that the Female Voice and the T3 alarm consistently resulted in faster response times than the Australian Standard Alarm signal. It also shows that response times are appreciably increased when alcohol was taken, with the major increase in response time from sober to .05 for all signals.

A 3x3x2 Mixed Analysis of Variance was used to calculate differences in time to behavioural response. The first factor was the within subjects factor of Sound, with the three levels corresponding to Female Voice, Australian Standard Alarm, and T3 alarm. The second factor was the within subjects factor of Alcohol, with the three levels corresponding to Sober, .05 BAC, and .08 BAC. The third factor was the between subjects factor of Sex which explored differences in response times between males and females. The analysis was performed using the time taken to behavioural response.

Results of the ANOVA showed significant main effects for Sound $F(2,20) = 5.984$, $p = .009$, and for Alcohol $F(2,20) = 9.810$, $p = .001$. No significant differences were found between the sexes. There were also no significant interactions found between sound type and alcohol level. These results confirm significance of the trends displayed in Tables 1 and 2 which distinguish the time and sound intensity differences required for the different signals under the different alcohol conditions.

DISCUSSION

The hypothesis that participants would respond to the female voice alarm at the lowest volume, and in the fastest time, and that no significant difference in the response patterns to the two beeping signals would be found was not supported. Somewhat surprisingly, it was found that the female voice alarm and the T-3 were equally successful in all alcohol conditions, but that these were both significantly more successful than the Australian Standard Alarm signal.

Most importantly, the further hypothesis that for all signals, participants would respond at the lowest volume and with the most speed when they were sober, followed by .05 BAC, and then .08 BAC was upheld, with the difference of the highest magnitude between the sober and .05 BAC conditions.

Response to different signals

Regardless of how the data is considered, the Female Voice and the T-3 Alarm were equally successful in arousing individuals from sleep in all conditions, with both being significantly more successful than the Australian Standard Alarm signal. Most interesting is that both elicited a behavioural response in the sober condition around 90 seconds faster, or at around 20dBA less volume, than the Australian Standard Alarm. This constitutes a difference of considerable magnitude that was in excess of our a priori expectations.

In the .05 BAC condition, these differences appear diminished, and for the .08 BAC condition, the Female Voice elicited a response 50 seconds faster, and the T-3 around 30 seconds faster than the Australian Standard Alarm. Individual response patterns were considerably variable, meaning that caution must be taken when analysing the finer points of difference between the signals. Any given individual may have responded fastest to the Female Voice on one night, but then fastest to the T-3 on another. However the overall pattern of results indicated significant differences that separated both of these signals clearly from the Australian Standard Alarm.

On the surface of things, the failure to find a difference between the Female Voice and the T-3 is difficult to understand given that previous research has found that for sleeping individuals, the important parameter in determining a response to auditory stimuli is emotional significance. [13,14,15,16] In fact, those studies used MRI and EEG technology to show that the brain regions associated with emotional processing are stimulated to precipitate wakefulness in response to a participant's name *only when they are asleep.* The Female Voice alarm was specifically scripted and delivered with emotional overtones in order to maximise this effect. When this signal was played to participants prior to lights out in the sober condition, informal assessment of their reactions suggested it always elicited an emotional response. These responses ranged from embarrassed giggles, to remarks that it caused a person to feel a mild physiological fear response such as tingling or shivers. The T-3, on the other hand, elicited no such responses. In line with what has been found previously, [17] most people failed to recognise the T-3 as a fire alarm, and many remarked that it sounded like the busy signal on a phone, or the sound emitted from a reversing truck.

Closer examination of the parameters of the different sounds reveals that they vary in more than simply emotional content. Inspection of Figures 1 through 3 shows that the sounds differ in quality in two distinct ways - pitch and complexity. These parameters can be easily understood if we consider musical notes played on a piano. Pitch, as would be expected, refers to the tonal quality of a sound and is related to the frequency of sound waves. Complexity refers to the number of overtones that are present in any given sound, for example the sound of a single note being played is pure and uncomplicated, however the sound of a chord results from several individual notes resonating simultaneously. If we consider the signals used for the current study in this way then the Female Voice can be described as complex, because of the range of peaks from 315Hz to 2500Hz. Dominant peaks, or overtones, are present at 400Hz, 1600Hz, and 2000Hz. Although the T-3 is a less complex sound than the Female Voice, it is can still be considered moderately complex, with specific peaks at 500Hz, 1600Hz, and 2500Hz. Note the similarity in the parameters of these two sounds, particularly the dominant overtones. The parameters for the Australian Standard Alarm, on the other hand, are demonstrably different. This is a less complex tone at a considerably higher pitch, with dominant peaks at 4000Hz and 5000Hz. These pitch levels are unlikely to be produced by the human voice.

Therefore it is suggested that the T-3 signal was equally as successful as the Female Voice because of the similarities in pitch and complexity they share. This provides support for the assumption that the sleeping human brain monitors the external environment preferentially for sounds in the human voice range of pitch. At the time of writing, research investigating this hypothesis was underway. Furthermore, *the same pattern of results* has been found by our research team in investigations with children aged from 6 to 10. [20]. The implications of this are vitally important because signal specifications laid out in both the International and Australian Standards make no recommendations regarding the pitch of a signal. If continuing research supports the importance of pitch, then Standards must be amended accordingly in the hope of increasing the efficiency of smoke alarms for sleeping individuals.

Another interesting implication of these findings is that factors identified as conveying urgency by people when they are awake may not be perceived in the same way when they are asleep. The Female Voice signal was constructed based upon the findings of research carried out to optimize the meaning and level of urgency conveyed by emergency alarms with an industrial application[21] (See Ball & Bruck, this volume for a complete discussion). This same body of work has laid down parameters that will maximize the perceived urgency conveyed by beeping signals. Researchers have determined that important parameters for urgency are increased speed, pitch, and repetition[22]. If this holds true for sleeping individuals, then the Australian Standard Alarm signal should have been the most successful, rather than the least.

The effects of alcohol

Perhaps the least surprising but most important finding of the current study is that drinking alcohol significantly affects a person's ability to awaken to auditory alarm signals. What is surprising, however, is that participants were affected at a blood alcohol concentration as low as .05. Perusal of the mean response times presented in Table 3 shows that increasing the amount of alcohol intoxication to .08 also increases this effect, but to a much lesser degree. The meaning of this is that even at what many would consider to be low to moderate levels, alcohol can seriously affect a sleeping person's ability to respond to their smoke alarm. In fact many participants reported feeling only slightly 'tipsy' at bedtime in the .05 BAC condition. It is of vital importance that the general public be provided with this information in the hope that awareness will lower the number of alcohol implicated fire fatalities. Results of a telephone survey of 938 randomly selected individuals in the United States found that although people tend to accurately estimate the proportion of victims of fatal drowning, poisoning, falls, and motor vehicle accidents who are legally drunk, they tend to underestimate the proportion of victims of fatal fires who are likewise intoxicated.[23] Given that social drinking is embraced in Western societies it is no surprise that people who are under the influence of alcohol are perishing in fires.

Also of concern is the number of occasions upon which participants slept through a signal when alcohol was imbibed. The most compelling data presented in Table 2 shows that, regardless of signal, 36.11% of all trials resulted in no response before 95dBA, or worse still no response at all, at just .05 BAC. This was increased to a startling 41.67% when the BAC was elevated to .08. The international standard for audible emergency evacuation signals requires that the minimum sound intensity level at the bed head should be 75dBA when the signal is being used to awaken sleeping individuals (ISO 8201). The results imply that it is unlikely that the mandated sound level would have aroused one in three participants at .05 BAC, and almost half of all participants at .08 BAC.

Strengths, limitations and directions for future research

Testing in the participants' own bedrooms allowed for real world conditions to be closely maintained, thereby enhancing the ecological validity of results. This was considered an important factor in the current research as it allowed the alarm signals to be tested in close to real world situations, the only difference being that the sound was coming from speakers at approximately ear level, instead of from above, and the sound level at the pillow was carefully monitored, unlike the situation in most homes.

It must be noted that all findings from the current study apply to young adults who are self-reported deep sleepers. Our aim in choosing this group to study was that the best alarm should be capable of arousing the deepest sleeper, in the deepest stage of sleep. Given that an important aim of the project was to explore the effects of alcohol, studying a younger group (who sleep even more deeply) was impossible. Additionally, the patterns of sleep and alcohol use, as well as mortality rates in residential fires determined that studying this group would lead to the most meaningful results.

Future research needs to be carried out in order to replicate these findings, and to test the assumption that these results apply for other groups in society. Furthermore, it is important that specific research be undertaken to explore the relevance of these findings for the elderly, a group that is particularly vulnerable to dying in a fire.

Conclusions

The results of this study suggest that signal pitch may be a most important factor in residential alarm signal design, with lower pitch alarms eliciting a response at a lower intensity and in a shorter space of time compared to the high pitch signal currently used in Australian homes. Furthermore, given the variability of individual responses and the success rate of both the T-3 and the Female Voice signals, it is suggested that the best signal would combine both in an alternating pattern of, for example, 30 seconds each..

Results of this study also suggest that drinking alcohol, even in moderation, will adversely affect a person's ability to awaken to their smoke alarm. Public awareness campaigns have ensured that people are well aware of the role that alcohol intoxication plays in increasing the risk of accident or injury while driving, and have been advised on safe levels of drinking and appropriate behaviours. Few, however, are aware that having just a few drinks at home and going to bed increases the risk of them failing to respond to their alarm in case of a fire.

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