

A SURVEY TO IDENTIFY PHYSICALLY DEMANDING TASKS PERFORMED DURING STORM DAMAGE OPERATIONS BY AUSTRALIAN STATE EMERGENCY SERVICES PERSONNEL

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BACKGROUND



- Storm events and floods account for **40-50%** of all disaster-related deaths worldwide
- In Australia, storms cause more damage than any other event
- Storms = \$\$\$ - major storm events in Australia can cause insurance losses of more than **\$1.5 billion**
- The prevalence of storms has necessitated the formation of agency branches specifically trained for storm management

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STORM MANAGEMENT

- In Australia, the **State Emergency Services** (SES) is the lead storm response organization
- ~27,000 volunteer members nationwide
- SES personnel typically perform tasks such as;

sandbagging properties



assisting civilians



clearing debris



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WHAT ELSE DO WE KNOW...?

...not much!

Little is known about the tasks performed by the SES

- which tasks are most **important**?
- how **physically demanding** are they?
- **how often** do they occur, and **how long** do they take?
- what are the **principal actions** and **fitness components** used?

...and why is this information important?



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- Recent legislation states that **volunteers** are owed the same **duty of care** as paid workers
- **SO?** The SES is **legally responsible** for ensuring that volunteers are capable of the work required of them



- Identifying and characterizing SES tasks may allow development of **fitness guidelines** to ensure volunteers safety

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JOB TASK ANALYSIS

- **STEP 1** **Job inventory**
- **STEP 2** Use **objective** or **subjective** methods?
- **STEP 3** **Large scale survey** or **small committee?**



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AIM: To undertake a subjective JTA to identify the most **physically demanding** tasks performed by SES personnel during storm damage work, and then characterize their:

- operational importance
- frequency
- duration
- principal actions (i.e., movements)
- underlying fitness components

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METHODS

- Job inventory of tasks compiled from training manuals, policy documents & subject matter expert consultation
- Tasks filtered by operational importance
- Important tasks included in an anonymous online survey
- 903 SES personnel responded to the survey
- Provided information on:
 - **importance** - **physical demand** - **frequency** - **duration** - **movements** - **fitness components**
- Most physically demanding tasks chosen for further analysis



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RESULTS & DISCUSSION



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Participant Demographics

Age (years)	43.1 ± 13
Height (cm)	173.9 ± 11.5
Weight (kg)	86.0 ± 18.8
Years in SES	9.6 ± 8.8
Storm damage responses in past 2 years	22.1 ± 25.1
Males (%)	74
Females (%)	26



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12 PHYSICALLY DEMANDING TASKS

1. Box lifting (single-person)
2. Moving in a roof
3. Erecting external weather proofing
4. Clearing debris using hand/power tools (at heights)
5. Covering roof damages with tarpaulin
6. Constructing support for storm damaged walls
7. Shoveling sand (with hands)
8. Shoveling sand (using handtools)
9. Filling sandbags
10. Lifting sandbags
11. Holding sandbags
12. Carrying sandbags



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Task	Physical Demand (1 = low, 7 = high)			Operational Importance (1 = low, 7 = high)		
	Mean	Median	Mode (%)	Mean	Median	Mode (%)
1. Box lifting (single-person)	5.0 ± 1.4	5	6 (25)	5.2 ± 1.5	5	6 (26)
2. Moving in a roof	5.0 ± 1.5	5	6 (26)	5.7 ± 1.4	6	7 (36)
3. Erecting external weather proofing	5.2 ± 1.3	5	6 (29)	6.1 ± 1.1	6	7 (46)
4. Clearing debris using hand and/or power tools (at heights)	5.6 ± 1.2	6	6 (35)	5.8 ± 1.2	6	7 (35)
5. Covering roof damages with tarpaulin	5.5 ± 1.3	6	6 (33)	6.3 ± 0.9	7	7 (51)
6. Constructing temporary support for storm damaged walls	5.2 ± 1.3	5	6 (33)	5.7 ± 1.4	6	7 (33)
7. Shoveling sand (with hands)	5.9 ± 1.3	6	7 (45)	4.4 ± 2.1	5	7 (20)
8. Shoveling sand (using handtools)	5.7 ± 1.2	6	6 (33)	5.7 ± 1.3	6	7 (34)
9. Filling sandbags	5.5 ± 1.3	6	6 (31)	5.8 ± 1.2	6	7 (36)
10. Lifting sandbags	6.1 ± 1.0	6	7 (44)	5.8 ± 1.2	6	7 (35)
11. Holding sandbags	5.3 ± 1.6	6	6 (26)	5.6 ± 1.4	6	6 (30)
12. Carrying sandbags	6.2 ± 0.9	6	7 (27)	5.8 ± 1.2	6	7 (35)


- All 12 tasks have mean, median and mode values of **≥ 5** out of 7 for physical demand
- All tasks ranked highly for operational importance



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Task	Frequency (times per shift)			Duration (minutes per task repetition)		
	Mean	Median	Mode (%)	Mean	Median	Mode (%)
1. Box lifting (single-person)	5.9 ± 8.2	4	2 (20)	11.2 ± 21.9	5	5 (32)
2. Moving in a roof	3.6 ± 7.6	2	1 (32)	23.5 ± 45.6	15	20 (17)
3. Erecting external weather proofing	4.5 ± 7.2	3	2 (20)	37.0 ± 37.0	30	30 (20)
4. Clearing debris using hand/power tools (at heights)	4.1 ± 7.4	3	1 (24)	26.5 ± 26.2	20	20 (16)
5. Covering roof damages with tarpaulin	4.4 ± 8.5	3	1 (23)	42.4 ± 43.1	30	30 (22)
6. Constructing temporary support for storm damaged walls	1.8 ± 7.3	1	1 (49)	32.0 ± 32.3	30	30 (20)
7. Shoveling sand (with hands)	3.7 ± 14.3	0	0 (57)	15.1 ± 31.4	5	0 (43)
8. Shoveling sand (using handtools)	20.2 ± 167.7	3	1 (22)	32.8 ± 67.8	20	30 (18)
9. Filling sandbags	35.3 ± 194.4	4	1 (19)	24.1 ± 36.9	15	30 (13)
10. Lifting sandbags	40.6 ± 216.4	5	1 (14)	17.0 ± 33.7	10	1 (17)
11. Holding sandbags	41.6 ± 223.6	5	1 (15)	16.5 ± 33.8	5	5 (16)
12. Carrying sandbags	41 ± 216.4	5	1 (15)	22.9 ± 64.4	10	5 (18)

- Frequency and duration results are **highly** variable
 - Open ended responses
 - Genuine within-job differences
 - Influenced by type/severity of storm
 - Problems with frequency recall



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Task	Bend	Lift	Twist	Carry	Walk	Pull	Climb	Push	Crawl	Sit	Dig	Muscular Strength	Muscular Endurance
1. Box lifting (single-person)	X	X	X	X	X							X	X
2. Moving in a roof	X		X		X		X		X	X		X	X
3. Erecting external weather proofing	X	X	X	X	X	X	X	X	X	X		X	X
4. Clearing debris using hand/power tools (at heights)	X	X	X	X	X	X	X	X				X	X
5. Covering roof damages with tarpaulin	X	X	X	X	X	X	X	X	X	X		X	X
6. Constructing temporary support for storm damaged walls	X	X	X	X	X	X		X				X	X
7. Shoveling sand (with hands)	X	X	X	X							X	X	X
8. Shoveling sand (using handtools)	X	X	X	X	X						X	X	X
9. Filling sandbags	X	X	X								X	X	X
10. Lifting sandbags	X	X	X	X								X	X
11. Holding sandbags	X	X		X								X	X
12. Carrying sandbags	X	X	X	X	X							X	X



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WHAT DO WE KNOW NOW?

- Storm damage work has **12 physically demanding tasks**
 - Carrying sandbags
 - Lifting sandbags
 - Shoveling sand (with hands)
- All tasks are considered **operationally important**
 - Covering roof damages with tarpaulin
 - Erecting external weather proofing
- **Bend, lift, twist, carry & walk** - most common actions
- **Muscular strength & endurance** required for all tasks
- **Frequency & Duration** results are **highly variable**



Information could be used to develop a personal screening test for SES personnel



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