

BAB V PENUTUP

A. Kesimpulan

Berdasarkan hasil pengujian kinematika menggunakan *software Kinovea* serta analisis sinyal *elektromiografi* (EMG) pada otot lengan atas dan bawah siku selama penggunaan walker konvensional dan walker adaptif, maka dapat disimpulkan sebagai berikut:

1. Berdasarkan hasil analisis kinematika menggunakan *software Kinovea* serta analisis sinyal *elektromiografi* (EMG) pada otot lengan atas dan bawah siku selama penggunaan walker konvensional dan walker adaptif, dapat disimpulkan bahwa variasi sudut pada walker memberikan pengaruh terhadap perubahan pola gaya berjalan lansia. Hasil pengujian menunjukkan bahwa sudut tertinggi rata-rata terbentuk pada penggunaan walker konvensional saat posisi posterior awal dengan nilai sudut sebesar $144,4^\circ$, sedangkan sudut terendah rata-rata terbentuk pada penggunaan walker adaptif pada posisi anterior akhir dengan sudut 45° dan nilai rata-rata sudut sebesar $95,6^\circ$. Perbedaan sudut tersebut menunjukkan bahwa walker adaptif mampu menghasilkan postur dan konfigurasi sudut lengan yang lebih ergonomis dibandingkan walker konvensional, sehingga berpotensi meningkatkan kenyamanan dan kestabilan lansia selama berjalan.
2. Analisis distribusi beban berdasarkan respon aktivitas otot lengan atas dan bawah siku menunjukkan adanya perbedaan beban yang diterima tubuh pada masing-masing jenis walker dan variasi sudut. Nilai distribusi beban terendah diperoleh pada penggunaan walker adaptif dengan sudut 40° pada posisi *anterior* awal dengan nilai EMG sebesar 1,613 mV, sedangkan distribusi beban tertinggi terjadi pada penggunaan walker konvensional pada posisi *middle* akhir dengan nilai EMG sebesar 1,638 mV. Hasil ini mengindikasikan bahwa penggunaan walker adaptif dengan sudut tertentu mampu mengurangi beban kerja otot lengan dibandingkan walker konvensional, sehingga dapat menurunkan risiko kelelahan otot dan meningkatkan efisiensi penggunaan alat bantu berjalan pada lansia.
3. Hasil uji statistik menggunakan *Repeated Measure ANOVA* menunjukkan bahwa nilai signifikansi pada baris *Greenhouse–Geisser* dalam tabel *Tests of Within-Subjects Effects* untuk seluruh kelompok pengujian bernilai $p < 0,05$. Nilai tersebut menunjukkan bahwa terdapat perbedaan yang signifikan secara statistik pada

distribusi beban lengan atas dan bawah setelah dilakukan pengujian, sehingga dapat disimpulkan bahwa variasi jenis walker, sudut adaptif, dan posisi berjalan memberikan pengaruh yang bermakna terhadap respon biomekanik ekstremitas atas lansia. Berdasarkan analisis nilai RMS sinyal EMG, sudut walker adaptif 40° dapat direkomendasikan sebagai sudut yang paling tepat karena menghasilkan aktivitas otot terendah, yang mencerminkan kondisi kerja otot yang lebih efisien dan ergonomis dalam mendukung aktivitas berjalan lansia.

B. Saran

Berdasarkan temuan penelitian ini, penelitian selanjutnya disarankan untuk mengembangkan kajian ini dengan memperluas karakteristik subjek, tidak hanya terbatas pada lansia pengguna walker dengan penurunan fungsi ekstremitas bawah, tetapi juga melibatkan variasi tingkat kemampuan fungsional atau kelompok pembanding guna memperoleh hasil yang lebih komprehensif. Penggunaan alat EMG *multichannel* perlu dipertimbangkan sebagai pengembangan dari penggunaan EMG satu kanal agar aktivitas beberapa kelompok otot dapat dianalisis secara simultan dan lebih akurat. Selain perekaman visual untuk menganalisis sudut subjek menggunakan *software Kinovea* dan pengukuran berbasis respon otot lengan atas dan bawah siku menggunakan EMG, analisis distribusi beban dapat dikombinasikan dengan sensor gaya atau tekanan pada pegangan walker untuk memperoleh data yang lebih objektif. Pengukuran pada penelitian ini hanya dilakukan pada tangan kanan dari posisi *anterior* hingga *posterior* juga dapat dikembangkan dengan melibatkan kedua tangan serta variasi kondisi berjalan. Dalam konteks Teknik Industri, hasil penelitian ini dapat dijadikan dasar pengembangan desain walker adaptif berbasis ergonomi melalui pendekatan *user-centered design* dan optimasi desain produk, sehingga menghasilkan alat bantu berjalan yang lebih aman, nyaman, dan efisien bagi pengguna lansia.

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