Figure 2

# IMPORTANCE OF 24-HOUR PHYSICAL BEHAVIORS FOR TYPE 2 DIABETES

## SITTING/BREAKING UP PROLONGED SITTING

Limit sitting. Breaking up prolonged sitting (every 30 min) with short regular bouts of slow walking/simple resistance exercises can improve glucose metabolism.

## STEPPING

- An increase of only 500 steps/day is associated with 2–9% decreased risk of cardiovascular morbidity and all-cause mortality.
- A 5-to 6-min brisk-intensity walk per day equates to ~4 years' greater life expectancy.

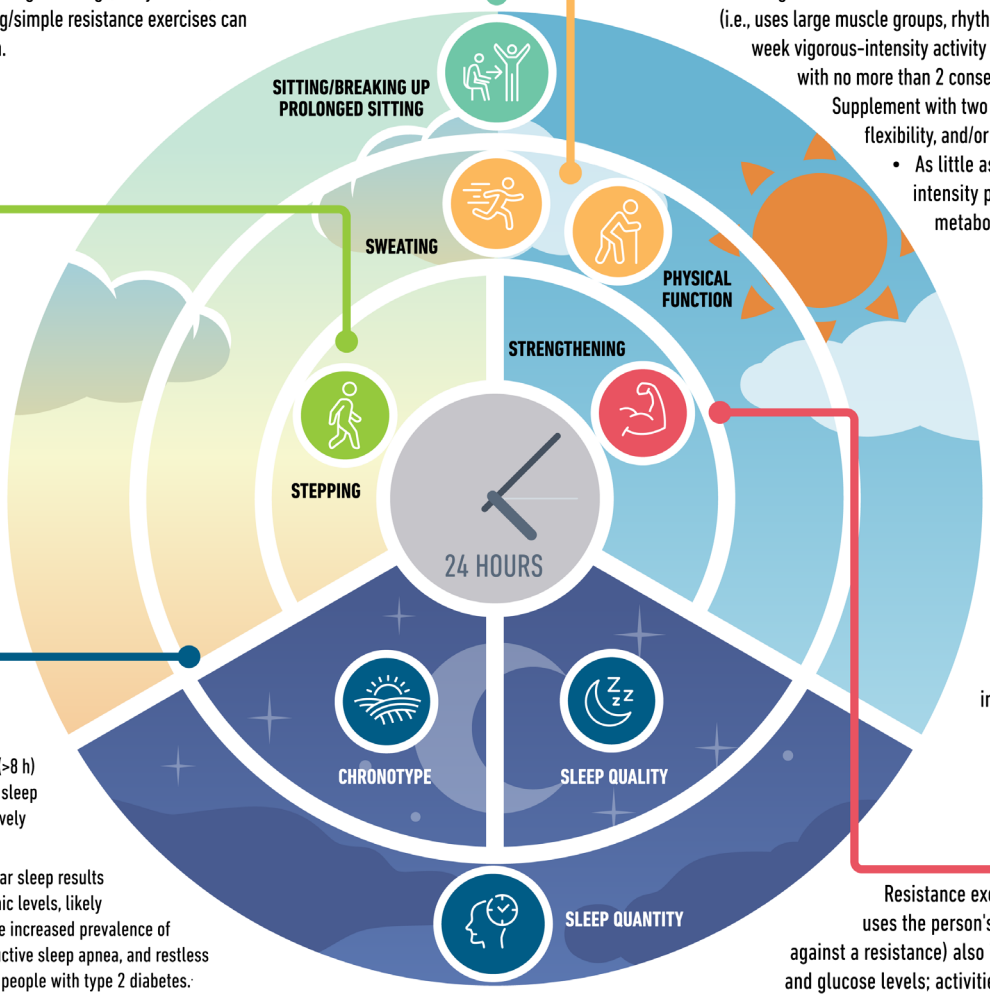
## SLEEP

Aim for consistent, uninterrupted sleep, even on weekends.

**Quantity** – Long (>8 h) and short (<6 h) sleep durations negatively impact $HbA_{1c}$.

**Quality** – Irregular sleep results in poorer glycemic levels, likely influenced by the increased prevalence of insomnia, obstructive sleep apnea, and restless leg syndrome in people with type 2 diabetes.

**Chronotype** – Evening chronotypes (i.e., night owl: go to bed late and get up late) may be more susceptible to inactivity and poorer glycemic levels vs, morning chronotypes (i.e., early bird: go to bed early and get up early).




## SWEATING (MODERATE-TO-VIGOROUS ACTIVITY)

- Encourage ≥150 min/week of moderate-intensity physical activity (i.e., uses large muscle groups, rhythmic in nature) OR ≥75 min/week vigorous-intensity activity spread over ≥3 days/week, with no more than 2 consecutive days of inactivity. Supplement with two to three resistance, flexibility, and/or balance sessions.
- As little as 30 min/week of moderate-intensity physical activity improves metabolic profiles.

**Physical function/frailty/ sarcopenia**

- The frailty phenotype in type 2 diabetes is unique, often encompassing obesity alongside physical frailty, at an earlier age. The ability of people with type 2 diabetes to undertake simple functional exercises in middle- age is similar to that in those over a decade older.

## STRENGTHENING

Resistance exercise (i.e., any activity that uses the person's own body weight or works against a resistance) also improves insulin sensitivity and glucose levels; activities like tai chi and yoga also encompass elements of flexibility and balance.

| | Glucose/insulin | Blood pressure | $HbA_{1c}$ | Lipids | Physical function | Depression | Quality of life |
|---|---|---|---|---|---|---|---|
| SITTING/BREAKING UP PROLONGED SITTING | ↓ | ↓ | ↓ | ↓ | ↑ | ↓ | ↑ |
| STEPPING | ↓ | ↓ | ↓ | ↓ | ↑ | ↓ | ↑ |
| SWEATING (MODERATE-TO-VIGOROUS ACTIVITY) | ↓ | ↓ | ↓ | ↓ | ↑ | ↓ | ↑ |
| STRENGTHENING | ↓ | ↓ | ↓ | ↓ | ↑ | ↓ | ↑ |
| ADEQUATE SLEEP DURATION | ↓ | ↓ | ↓ | ↓ | ? | ↓ | ↑ |
| GOOD SLEEP QUALITY | ↓ | ↓ | ↓ | ↓ | ? | ↓ | ↑ |
| CHRONOTYPE/CONSISTENT TIMING | ↓ | ? | ↓ | ? | ? | ↓ | ? |

## IMPACT OF PHYSICAL BEHAVIORS ON CARDIOMETABOLIC HEALTH IN PEOPLE WITH TYPE 2 DIABETES

↑ **Higher levels/improvement** (physical function, quality of life); ↓ **Lower levels/improvement** (glucose/insulin, blood pressure, $HbA_{1c}$, lipids, depression); ? no data available;
↑ **Green arrows = strong evidence;** ↑ **Yellow arrows = medium strength evidence;** ↑ **Red arrows = limited evidence.**

Importance of 24-h physical behaviors for type 2 diabetes.

Figure from the American Diabetes Association 2023 Standards of Care in Diabetes