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허약 노인이란?

건강상태에 따른 노인 분류

- **건강노인**: 일상생활활동이나 인지기능이 정상인 노인
- **허약 노인**: 건강노인과 장애노인의 중간단계에 있는 허약노인은 여러 기관의 기능이 점차 감소하고 생물학적 예비능력이 일정수준 이하로 저하되었을 경우에 발생.
  정상 노화와는 달리 동일한 스트레스에도 여러 질환이나 장애로 쉽게 진행되는 취약성 있음
  장애와 달리 조기에 사정하여 관리를 잘 하면 기능회복이 가능하다는 가역적인 특성이 있음
- **장애노인**: 신체적, 정신적 기능 감퇴로 제3자의 도움이 필요한 노인

(Zheng et al., 2016)

노인의 허약은 입원, 사망 등 부정적인 결과를 가져올 수 있으며, 65세 이상 허약 노인은 건강 노인에 비해 3년 이내 사망자 수가 6배나 높았다(Fried et al., 2004)
→ 만성질환 유병률과 유병기간을 최소화하여 최대한 오랜 기간 동안 독립적인 일상생활을 유지하고 일정 수준의 건강과 기능상태를 유지할 수 있도록 해야 함

허약 측정 요인

5요인: 피로, 저항, 이동, 지병, 체중감소 (Jung et al., 2016)
3요인: 신체적 요인, 정신 심리적 요인, 사회적 요인(김창오, 선우덕, 2015)

〈표 2-2-4〉 노쇠측정도구

구분	측정 영역	측정 지표	노쇠의 정의
K-frail 도구	피로	피로 정도	노쇠: 3개 영역 이상 전노쇠: 1~2개 영역 비노쇠: 0개 영역
	저항	10개 계단 오르기 가능 여부	
	이동	300m 이동 가능 여부	
	지병	진단받은 질환 5개 이상 여부	
	체중감소	5% 이상 감소 정도	
허약측정 도구	신체적 요인	악력 저하 - 남성 24kg 이하 - 여성 15kg 이하	노쇠: 2개 이상 영역 전노쇠: 1개 영역 비노쇠: 0개 영역
	정신심리적 요인	정신심리적 고갈 정도	
	사회적 요인	모임 및 단체 활동 참여 여부	

자료: Jung, H. W.

Physical activity recommendations for older adults

	Recommendations
Endurance exercise	≥ 5/week for moderate intensity or ≥ 3/week for vigorous intensity Moderate activities, 30-60min/d, total 150-300 min/week Vigorous activities, 20-30min/d, total 75-100 min/week Any modality that does not impose excessive orthopedic stress Walking is the most common type of activity
Resistance exercise	≥ 2 days/week Moderate intensity (60-70% 1RM) Light intensity(40~50% 1RM) for the beginners 8-10 exercises involving the major muscle groups of 10-15 repetitions each
Flexibility exercise	≥ 2 days/week Stretching for each major muscle group Hold stretch for 30-60 s.
Balance exercise	For frequent fallers or individuals with mobility problems 1) Gradually reduce the base of support 2) Dynamic movements that perturb the center of gravity 3) Stressing postural muscle groups 4) Reducing sensory input

Exercise and Physical Activity for Older Adults, ACSM Position Stand, 2014

Exercise Prescription for Older and Frail adults

TABLE: Exercise Prescription for Older and Frail Adults

	Modes	Frequency	Intensity	Duration
Aerobic exercise				
Older adults	Walking, cycling, recumbent cycling or stepping, swimming, large muscle group activities	3 to 5 days/week	Moderate, 5 to 6 on a 10-point scale. Vigorous, 7 to 8 on a 10-point scale.	5 to 60 minutes per session, several 10-minute bouts
Frail adults		3 to 5 days/week	Should not be the focus; as tolerated	Highly variable, 5- to 10-minute bouts
Resistance exercise*				
Older adults	Multistation weight machines; pneumatic and isokinetic machines provide greater safety; free weights, elastic bands, or household items	2 to 3 days/week	2 to 3 sets at 50% to 80% 1-RM	8 to 10 exercises, major muscle groups, 10 to 15 repetitions
Frail adults		2 to 3 days/week	1 to 3 sets at 20% to 80% 1-RM	8 to 10 exercises, major muscle groups, 8 to 12 repetitions or as tolerated
Flexibility exercise				
Older and frail adults	Static stretching, proprioceptive neuromuscular facilitation	2 days/week	As tolerated, a mild stretch without pain.	20 to 30 seconds per stretch, major muscle groups. Multiple muscle groups, focus on lower-limb ROM
Flexibility exercise				
Older and frail adults	Semitandem, tandem, or single-leg stance. Forward and backward heal-to-toe walking. Reduce sensory input, eyes closed.	No recommendation exists		

* High-velocity resistance training, focusing on lower-limb muscle power, may enhance strength and functional performance measures if tolerated by participant or client.
(Adapted from 3,6,11,16.)

Symons & Swank (2015)

Linking potential exercise modes with relevant functional limitations for frail elders

Table 2. Linking Potential Exercise Modes with Relevant Functional Limitations for Frail Elders.

Functional Limitation	Precautions and Exercise Modes
Basic activities of daily living	
Mobility and transferring	
Walker use	Chair arms available for seated resistance training Ensuring secure match between walker tips and floor surface for walking
Wheelchair use	Truncal and upper body motion and resistance training
Dressing and bathing	
Shoulder range of motion restricted	Pre-exercise local heat and active stretching
Truncal motion limited	Seated, non-weight-bearing rotational motion
Continence and toileting	Prompted voiding before and after exercise

Disability, more than multimorbidity, was predictive of mortality among older persons aged 80 years and older

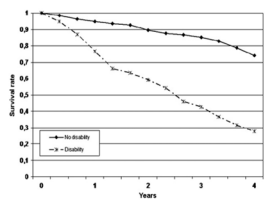


Fig. 1. Survival curves of subjects according to the presence of disability at baseline (log-rank test, $P < 0.001$).

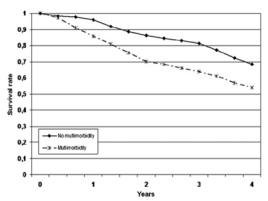


Fig. 2. Survival curves of subjects according to the presence of multimorbidity (two or more diseases) at baseline (log-rank test, $P < 0.01$).

Landi et al(2010), J Clin Epidemiol , 63, 752-759

Exercise for the prevention of falling

- Several large prospective cohort studies link higher levels of physical activity, particularly **walking**, with **30-50% reduction** in the risk of osteoporotic fractures.
- Balance training activities such as **lower body strengthening** and **walking over difficult terrain** have been shown to significantly improve balance in many studies and are this recommended as part of an exercise intervention to **prevent falls.**
- Multimodal programs of **balance, strength, flexibility** and **walking** are shown to reduce the risk of both noninjurious and injurious falls.
- There is some evidence that **tai chi programs** can be effective in reducing the risk of both noninjurious and injurious falls.

Exercise and Physical Activity for Older Adults, ACSM Position Stand, 2009

Exercise Programming Recommendations for Stroke Survivors

TABLE 1. Summary of Exercise Programming Recommendations for Stroke Survivors*

Mode of Exercise	Major Goals	Intensity/Frequency/Duration
Aerobic		
• Large-muscle activities (eg, walking, treadmill, stationary cycle, combined arm-leg ergometry, arm ergometry, seated stepper)	• Increase independence in ADLs • Increase walking speed/efficiency • Improve tolerance for prolonged physical activity • Reduce risk of cardiovascular disease	• 40%–70% peak oxygen uptake; 40%–70% heart rate reserve; 50%–80% maximal heart rate; RPE 11–14 (6–20 scale) • 3–7 d/wk • 20–60 min/session (or multiple 10-min sessions)
Strength		
• Circuit training • Weight machines • Free weights • Isometric exercise	• Increase independence in ADLs	• 1–3 sets of 10–15 repetitions of 8–10 exercises involving the major muscle groups • 2–3 d/wk
Flexibility		
• Stretching	• Increase ROM of involved extremities • Prevent contractures	• 2–3 d/wk (before or after aerobic or strength training) • Hold each stretch for 10–30 seconds
Neuromuscular		
• Coordination and balance activities	• Improve level of safety during ADLs	• 2–3 d/wk (consider performing on same day as strength activities)

ADLs indicates activities of daily living; RPE, rating of perceived exertion; and ROM, range of motion.
*From references 67, 71, 73, 75, 94, 95, and 96.

Fall prevention exercise program

Gschwind et al. (2013)

Table 4 Guidelines for dynamic steady-state, reactive, and proactive balance exercises

Balance (dynamic)	Exercise variables	Recommendations
Steady-state	Base of support	Stable to instable: normal gait – narrow gait – overlapping gait – tandem gait (Figure 3)
	Position of feet	i.e., lateral or medial weight shift, on heels or toes, toe angle in or out
	Surface	i.e., from soft to hard (e.g., grass to concrete), from stable to instable (e.g., concrete to sand)
	Sensory input	Impede vision or hearing
	Dual-/Multi-tasking	Additional motor task – additional cognitive task – additional motor and cognitive tasks
	Speed of movement	Decrease or increase of execution speed (i.e., walking speed)
	Equipment	Use of i.e., free weights, elastic bands, balls
	Direction	Forwards – backwards – to the left or right – diagonal
	Rhythm	Slow – fast – intermittent slow and fast
Reactive	Controlled perturbations applied by therapist	Reaction to external thread (push or pull) varying in speed, amplitude and direction on ankle, hip, trunk or shoulder level
Proactive	ADL	Combination of steady-state (dynamic) balance tasks with mobility in daily life (e.g., walking upstairs backwards while counting backwards aloud from 50 minus 2)

ADL activities of daily living.

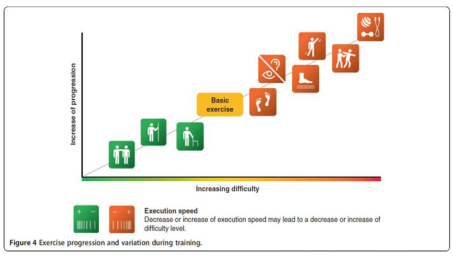
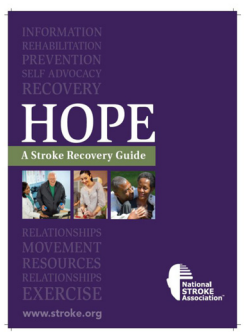
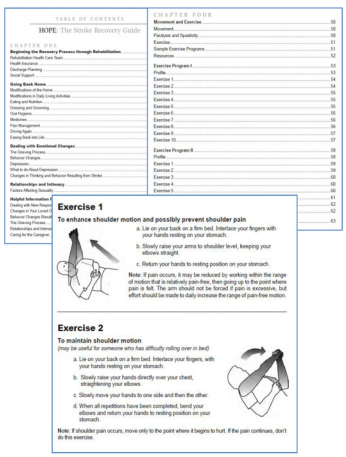
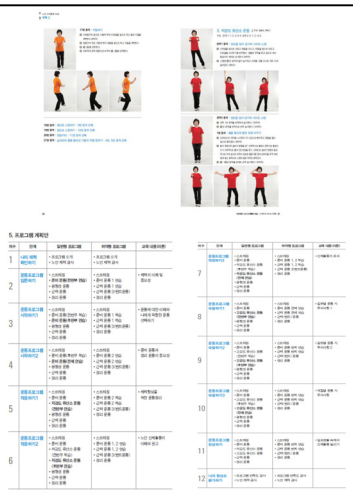


Figure 4 Exercise progression and variation during training.

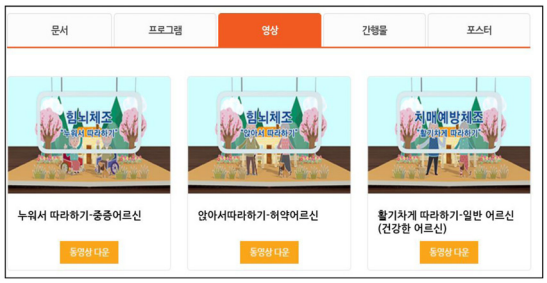
Stroke Recovery







치매예방운동법 - 중앙치매센터



https://www.nid.or.kr/info/ys_room.aspx

뇌졸중 환자를 위한 가정운동 프로그램

http://www.nrc.go.kr/nrc/data/data01View.jsp?no=15994&menu_cd=M_05_06_01&fno=40&depart_no=&depart=&part_no=&pg=1&search_item=0&search_content=

허약 노인을 위한 운동 프로그램 성과 측정

Commonly Used Physical Performance Tests for the Senior

Measurement	Time	Cut-point indicative of lower function
Senior Fitness Test	30min total	≤25th percentile of age-based norms
Short Physical Performance Battery	10 min	10 points
Usual Gait Speed	< 2 min	1m/s
6-Min Walk Test	< 10 min	≤25th percentile of age-based norms
Continuous Scale Physical Performance Test	60 min	57 points

Exercise and Physical Activity for Older Adults, ACSM Position Stand, 2014

다양한 신체기능 평가 도구

De Morton Mobility Index (DEMMI)
신체활동 동작의 위계적 단계

Berg Balance Scale
임상현장에서 노인의 신체균형과 낙상위험을 측정하기 위해 개발, 14개 문항

Barthel Index
일상생활동작과 self-car를 측정하는 15개 문항

Tinetti Asssessment Tool: Balance
걸음걸이 및 균형을 측정

Modified Elderly Mobility Scale
노인환자의 운동기능을 측정하는 7개 문항

Performance oriented mobility assessment
낙상 또는 낙상 위험을 평가할 때, 동작을 측정하는 18개 문항

제언

지역사회 건강증진사업의 일환으로 허약노인을 위한 다양한 운동프로그램들을 개발하고자 하는 경우 서비스 대상, 서비스 목표 및 내용, 서비스 제공 방식, 서비스 제공 인력, 성과측정 등을 고려하여 보다 실제적인 적용이 가능하도록 해야 할 것이다.