Sarcopenia and Metabolic parameters

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SARCOPENIA AND METABOLIC PARAMETERS

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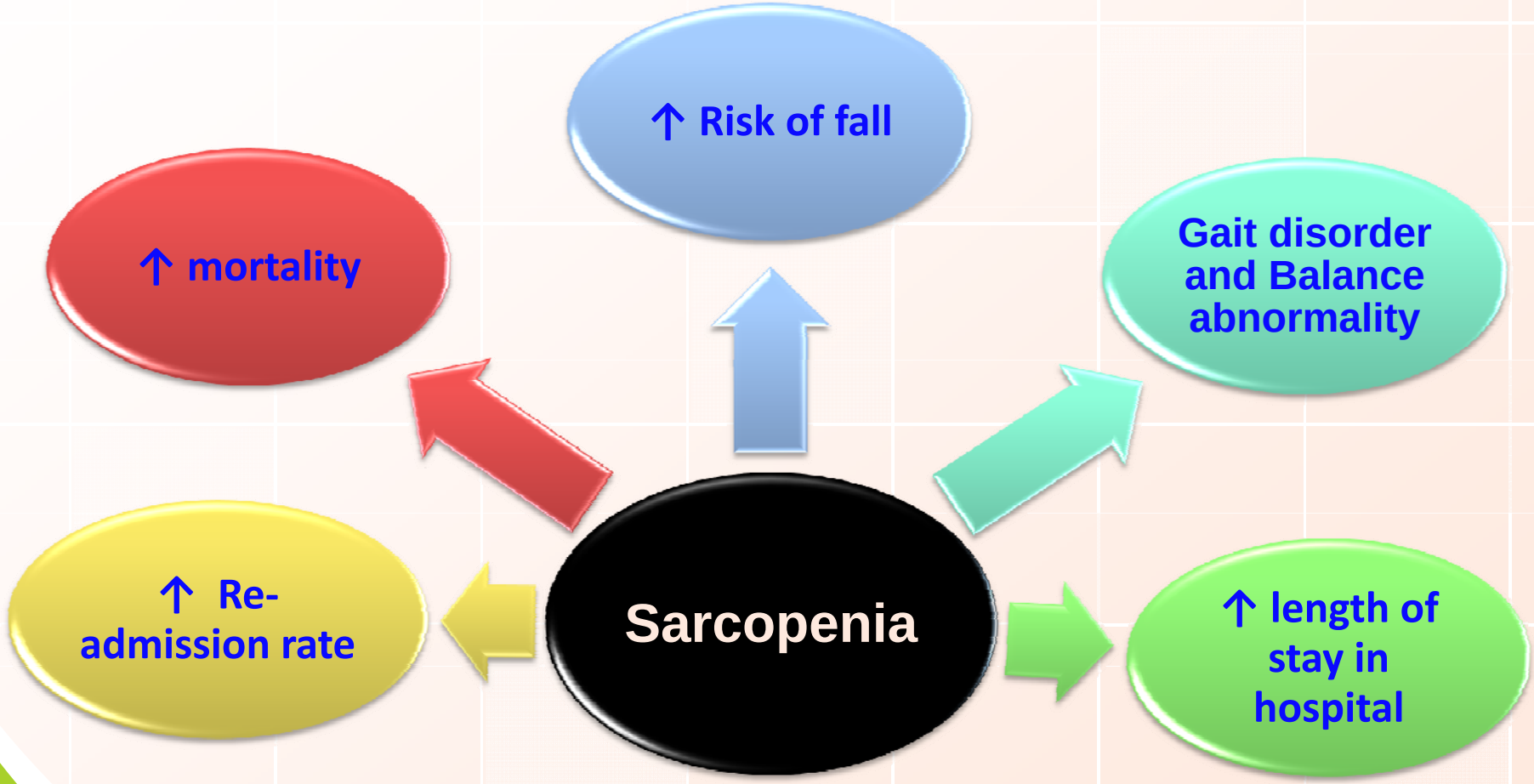
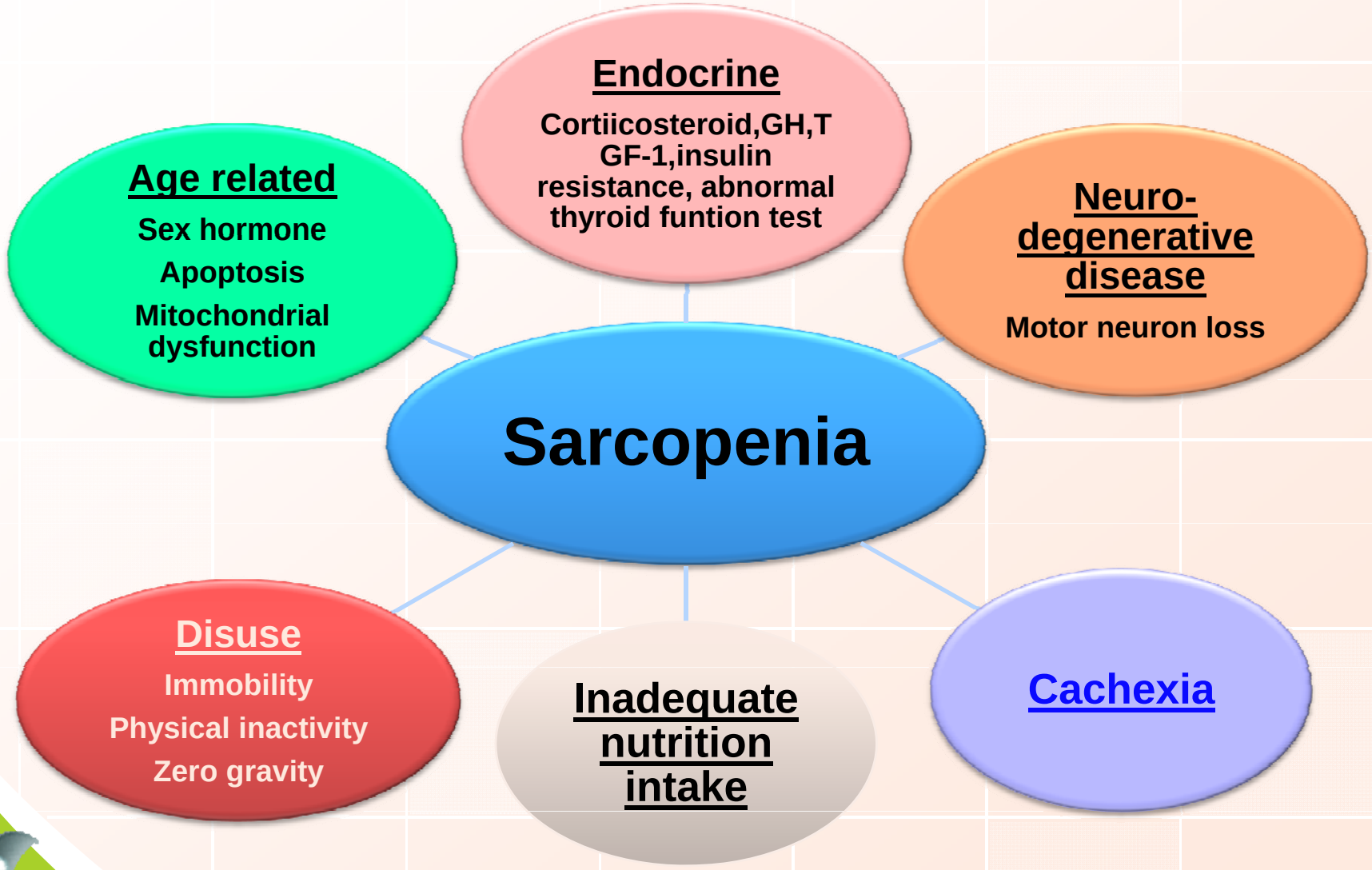
Introduction

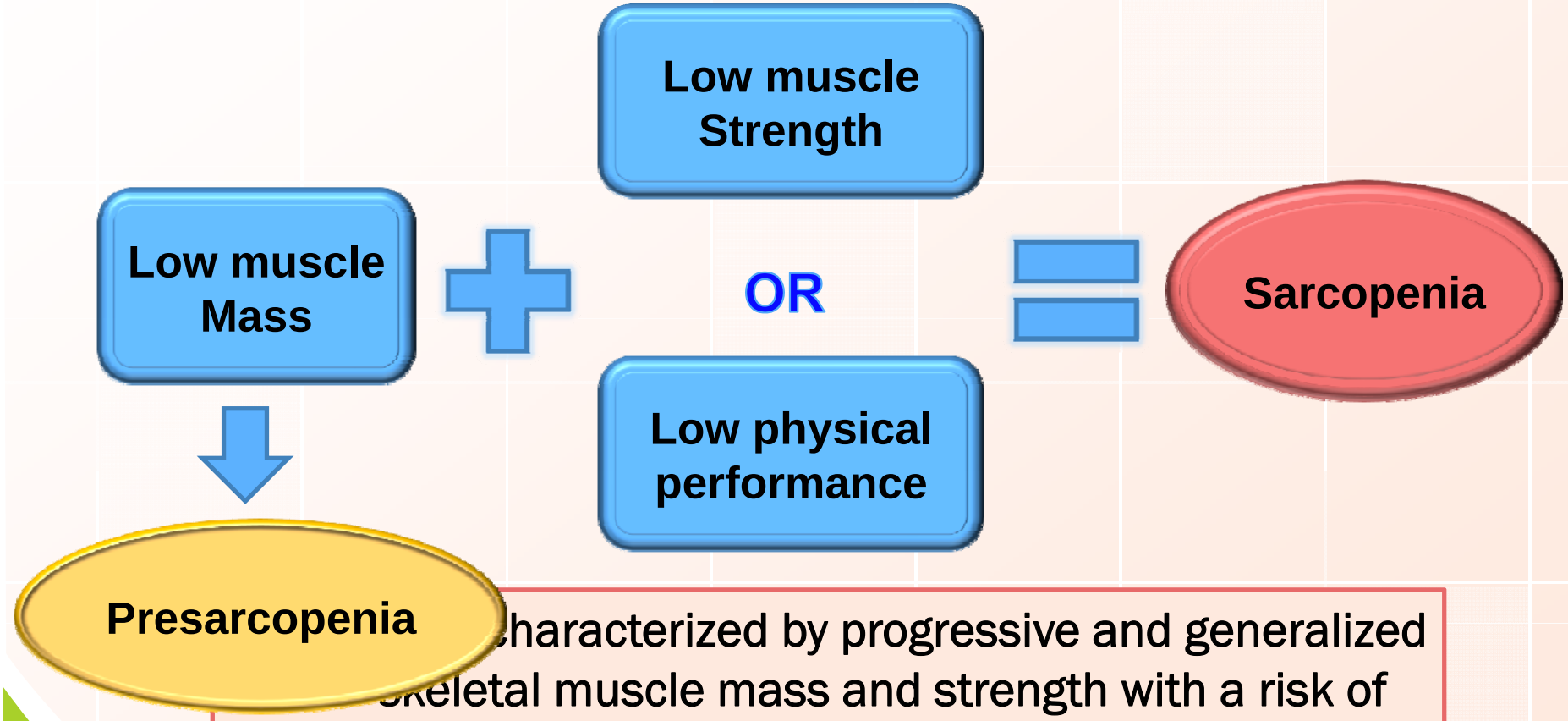


*The MINOS Study, J BONE AND MINERAL RESEARCH Vol 20, 5, 2005
**Sarcopenia: Prevalence and prognostic significance in hospitalized Patients, Clinical Nutrition 32 (2013) 772e776

Mechanism of sarcopenia



The 2010 European consensus definition of Sarcopenia



characterized by progressive and generalized skeletal muscle mass and strength with a risk of adverse outcomes, such as physical disability, poor quality of life, and death

Cruz-Jentoft AJ, et al. Age and ageing. 2010;39(4):412-23.

Objective

- To determine the cut point of low muscle mass in Urban Thai population
- To identify the prevalence of Low muscle mass in Elderly population
- To study the association between low muscle mass and metabolic disease and bone density

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Code	Formula	Cut-off point			Cohort used as reference population	Reference[a]
		Sarcopenia present	Men	Women		
A	ALM/height^2	>2 SD below reference population	7.26 kg/m^2	5.45 kg/m^2	Rosetta Study (1986–1992), 229 non-Hispanic white men and women aged 18–40 years	Baumgartner et al. 1998
B	ALM/height^2	Under 20th percentile	7.25 kg/m^2	5.67 kg/m^2	Health ABC Study (1997/1998), 2,976 men and women 70–79 years old black and white, Pittsburgh, Pennsylvania and Memphis, Tennessee	Delmonico et al. 2007
C			m^2	4.73 kg/m^2	NHANES survey (1999–2004) white men and women aged 20 years	Kelly et al. 2009
D				NA	NA	Delmonico et al. 2007[b]
E (1)		sarcopenia	%	28% 22%	NHANES III (1988–1994), 6,414 men and women aged 18–39 years non-Hispanic white, non-Hispanic black and Mexican-American	Janssen et al. 2002
F (1) (2)	Skeletal lean mass/height^2	ROC analysis was used to develop cutpoints associated with moderate (1) and high (2) physical disability	10.75 8.50 kg/m^2	6.75 5.75 kg/m^2	NHANES III (1988–1994), 4,502 subjects aged 60 years plus, non-Hispanic white, non-Hispanic black and Mexican-American	Janssen et al. 2004
G	Optimal cutpoint for grip strength, identified in the ROC curve, predicting walking slower than 0.8 m/s	Below optimal cutpoint	30.3 kg	19.3 kg	InCHIANTI (1998–2000), 1,030 subjects aged 20–102 years, Tuscany, Italy	Lauretani et al. 2003

> 2SD below reference population (18-40 y)

Under 20th percentile

Sarcopenia index
-- Appendicular lean mass/height^2

-- skeletal lean mass/body mass*100 = SMI

Define the cut off for low muscle mass

- Data from EGAT 3/1
- Healthy young population (Aged 25-40 y) as reference (n=1011)
- Parameters determining low muscle mass
  - Height adjusted(ASM/ht2)
  - Weight adjusted (ASM/wt * 100)
  - Cut off point
    - <1 SD → Class I sarcopenia
    - <2 SD → Class II sarcopenia

Healthy young subjects: EGAT3/1

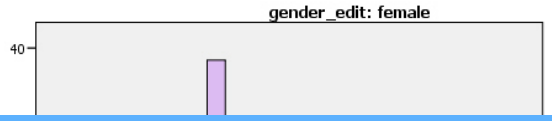
	Male (n=701)	Female (n=310)
Age, y	**34.7 (4.7)**	**35.2 (4.0)**
Height, cm	**170 (6.0)**	**159 (5.5)**
Weight, kg	**70.9 (11.7)**	**55.0 (9.7)**
BMI, kg/m2	**24.4 (3.6)**	**21.8 (3.6)**
Waist, cm	**88.1 (9.7)**	**77.4 (8.9)**
ASM/h2	**7.76 (0.73)**	**5.87 (0.74)**
ASM/wt*100	**32.11 (2.84)**	**27.22 (2.56)**

KNHANES

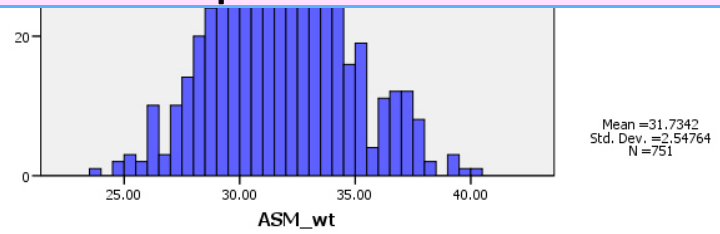
	Young Reference Group ($N = 2,513$)	
	Men ($N = 1,245$)	Women ($N = 1,268$)
Age (y)	31.0 ± 5.5	30.8 ± 5.6
Height (cm)	173.4 ± 5.8	160.4 ± 5.4
Weight (kg)	72.2 ± 11.1	56.9 ± 9.7
Waist circumference (cm)	82.6 ± 9.2	74.0 ± 9.6
Body mass index (kg/m^2)	24.0 ± 3.4	22.1 ± 3.5
ASM/height^2 (kg/m^2)	8.42 ± 0.92	6.18 ± 0.79
ASM/weight	35.4 ± 3.1	28.1 ± 2.6
Cutoff values for height-adjusted definition (kg/m^2)		
Class I sarcopenia	7.50	5.38
Class II sarcopenia	6.58	4.59
Cutoff values for weight-adjusted definition		
Class I sarcopenia	32.2	25.6
Class II sarcopenia	29.1	23.0

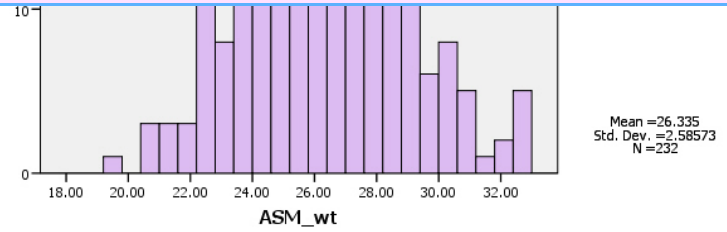
Kim YS, et al. J Gerontol A Biol Sci Med Sci 2012;67(10):1107-13

Characteristics of Healthy young subjects: EGAT3/1



	Male (n=701)	Female (n=310)
Cut off value for height-adjusted, kg/h^2		
Class I sarcopenia	**7.03**	**5.14**
Class II sarcopenia	**6.29**	**4.41**
Cut off value for weight adjusted, kg/wt*100		
Class I sarcopenia	**29.27**	**24.66**
Class II sarcopenia	**26.43**	**22.09**





EGAT
M≤ 6.29 kg/m²
F ≤ 4.41 kg/m²

KNHANES
M≤ 6.58 kg/m²
F ≤ 4.59 kg/m²

Citation	Method	Sarcopenia Index	Reference population	Gender	N	Age (years)	Prevalence
Baumgartner et al. 1998(5)	Anthropometrics	Appendicular lean mass m ≤ 7.26 kg/m2 f ≤ 5.45 k/m2	Rosetta study (98) (m/f 18–40 yrs)	m/f	883	61–70 71–80 ≥80	13% 24% 50%
Melton et al. 2000 (76)	DXA	Appendicular lean mass/ht2 m ≤ 7.26 kg/m2 f ≤ 5.45 k/m2	Rosetta study (98) (m/f 18–40 yrs)	m f	100 99	≥70	28% 52%
Morley et al. 2001 (70)	DXA	Appendicular lean mass/ht2 m ≤ 7.26 kg/m2 f ≤ 5.45 k/m2	Rosetta study (98) (ref.) (m/f 18–40 yrs)	m/f	199	<70 ≥80	12% 30%
Janssen et al, 2002 (71)	Bioelectrical impedance	Ratio of muscle mass/total body mass m≤31.5% f≤22.1%	NHANES III	m f	2,224 2,278	≥60 ≥60	7% 10%
Tanko et al, 2002 (75)	DXA	Appendicular lean mass/ht2 f ≤ 5.4 k/m2	Rosetta study (98) (m/f 18–40 yrs)	f	67	≥70	12%
Ianuzzi-Sacich et al, 2002 (74)	DXA	Appendicular lean mass/ht2 m ≤ 7.26 kg/m2 f ≤ 5.45k/m2	Rosetta study (98) (m/f 18–40 yrs)	m f	142 195	≥65	27% 23%
Gillette-Guyonnet et al, 2003 (73)		Appendicular lean mass/ht2 f ≤ 5.45 k/m2	Rosetta study (98) (m/f 18–40 yrs)	f	1,321	≥75	10%
Newman et al, 2003 (18)	DXA	Appendicular lean mass m≤ 7.23 kg/m2 f ≤ 5.67 kg/m2	Health Aging and Body Composition baseline cohort	m f	1,435 1,549	70–79	20% 20%
Castillo et al, 2004 (72)	Bioelectrical Impedance	Fat free mass m ≤ 47.9 kg f ≤ 34.7 kg	(99)(m/f 25–44)	m f	694 1,006	70–75 ≥85	4% 3% 16% 13%
Jansson et al, 2004 (100)	Bioelectrical Impedance	Total muscle mass/ht2 m ≤ 8.50 kg/m2 f ≤ 5.75 kg/m2	NHANES III	m f	2,223 2,276	≥60	11% 9%
Jansson et al, 2004(100)	Bioelectrical Impedance	Total lean mass/ht2 m ≤ 8.50kg/m2 f ≤ 5.75 kg/m2	Cardiovascular Health Study	M f	2,196 2,840	≥65	17% 11%
Schaap et al, 2006(101)	DXA	Longitudinal follow-up LASA study >3% loss of appendicular lean mass	LASA study	m f	328		15%*

M≤ 7.26 kg/m²
F ≤5.45 kg/m²

M≤ 7.23 kg/m²
F ≤5.67 kg/m²

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Characteristics and prevalence of sarcopenia: EGAT 3/1

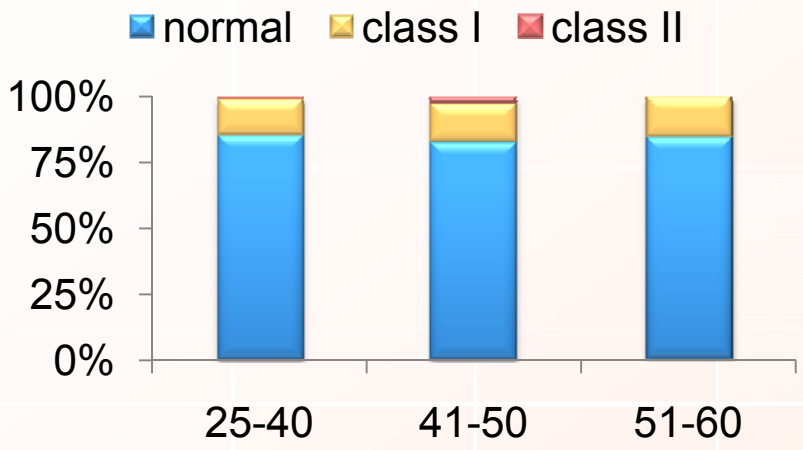
	Male (n=1671)	Female (n=637)
Age, y	40.3 (7.1)	39.9 (6.5)
Height, cm	169.4 (5.9)	157.9 (5.3)
Weight, kg	70.4 (11.2)	55.5 (9.9)
BMI, kg/m2	24.5 (3.5)	22.3 (3.8)
Waist, cm	88.9 (9.3)	78.5 (9.0)
ASM/h2	7.72 (0.72)	5.89 (0.73)
ASM/wt*100	31.74 (2.74)	26.75 (2.63)
Height-adjusted sarcopenia		
Class I sarcopenia, n (%)	243 (14.5)	84 (13.2)
Class II sarcopenia, n (%)	28 (1.7)	5 (0.8)
Weight-adjusted sarcopenia		
Class I sarcopenia, n (%)	242 (14.5)	38 (2.3)
Class II sarcopenia, n (%)	104 (16.4)	24 (3.8)

Characteristics and prevalence of sarcopenia in elderly: EGAT 1/5

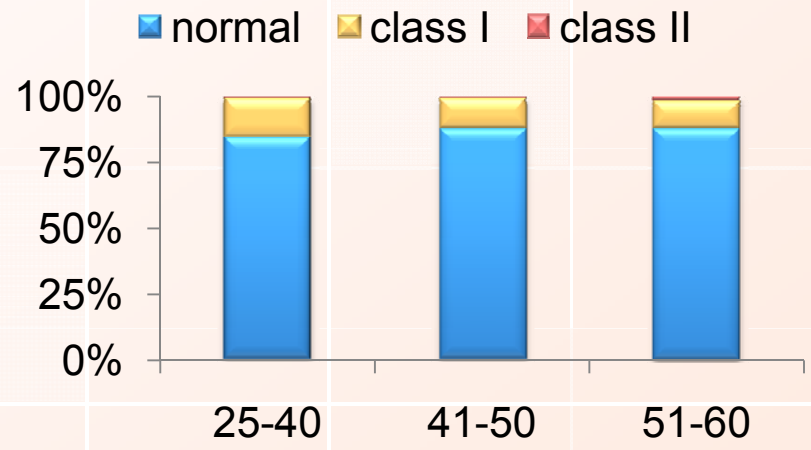
	Male (n=1046)	Female (n=364)
Age, y	69.1 (4.7)	67.9 (3.9)
Height, cm	164.4 (5.5)	153.1 (4.8)
Weight, kg	66.6 (10.1)	57.9 (9.9)
BMI, kg/m2	24.6 (3.4)	24.7 (4.0)
Waist, cm	89.7 (10.4)	85.7 (9.9)
ASM/h2	7.47 (0.73)	6.00 (0.79)
ASM/wt*100	30.64 (2.87)	24.62 (2.78)
Height-adjusted sarcopenia		
Class I sarcopenia, n (%)	214 (20.5)	41 (11.3)
Class II sarcopenia, n (%)	54 (5.2)	67 (6.4)
Weight-adjusted sarcopenia		
Class I sarcopenia, n (%)	276 (26.4)	142 (39.0)
Class II sarcopenia, n (%)	67 (6.4)	55 (15.1)

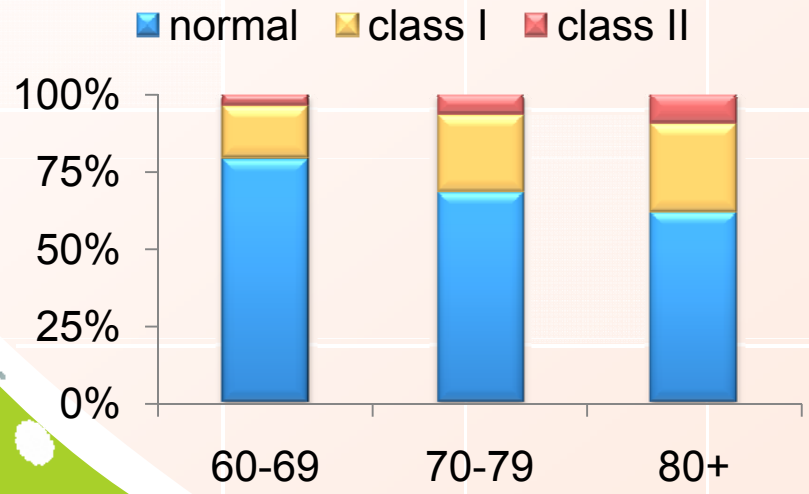
Height-adjusted sarcopenia by age group and gender

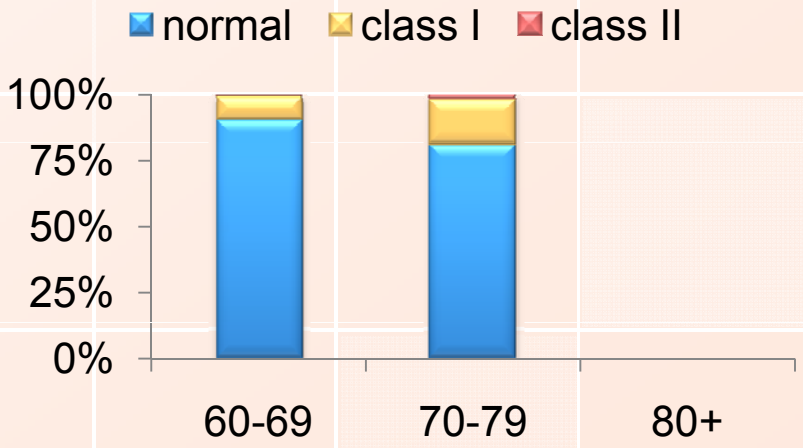
Male



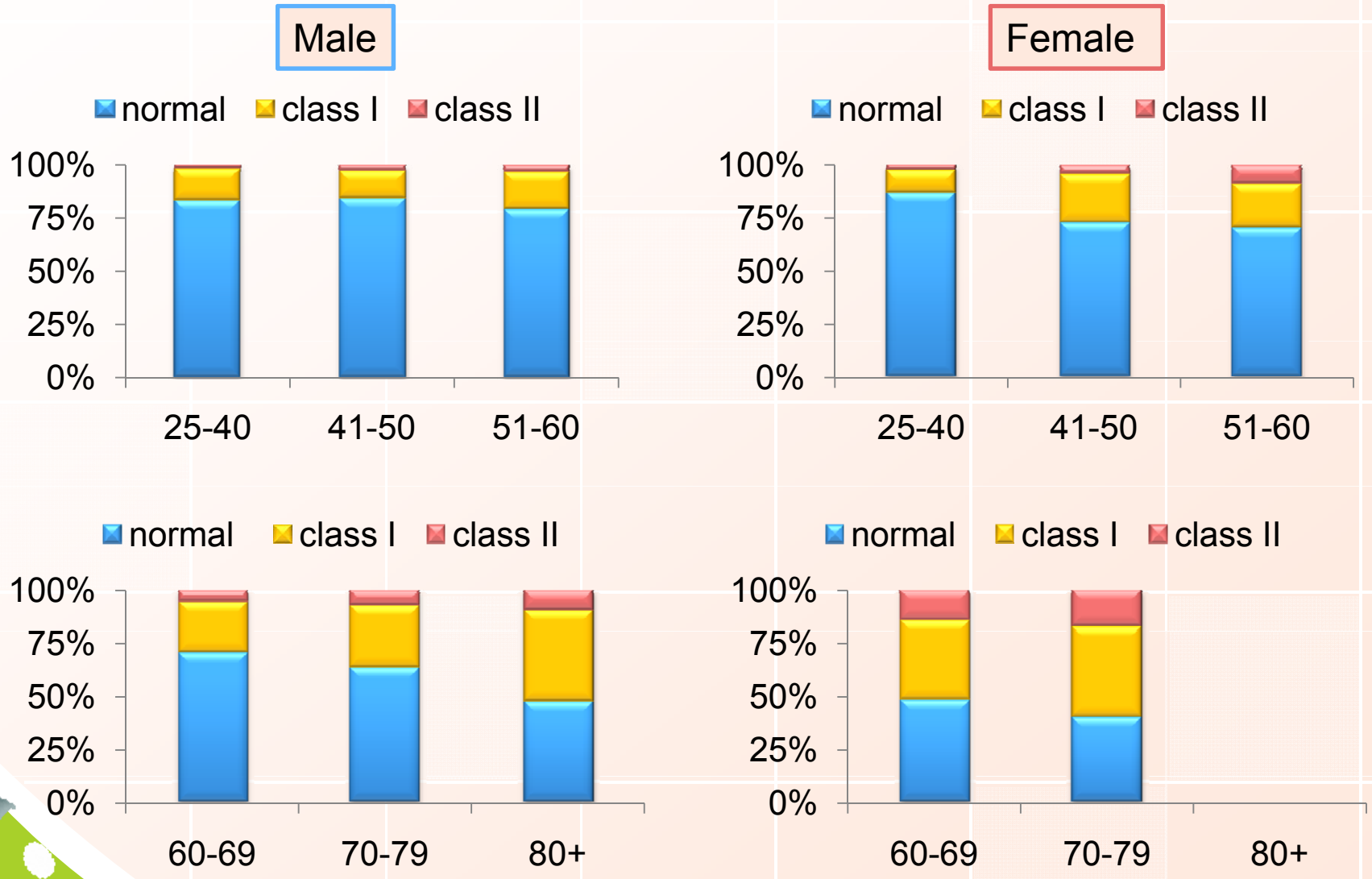
Female





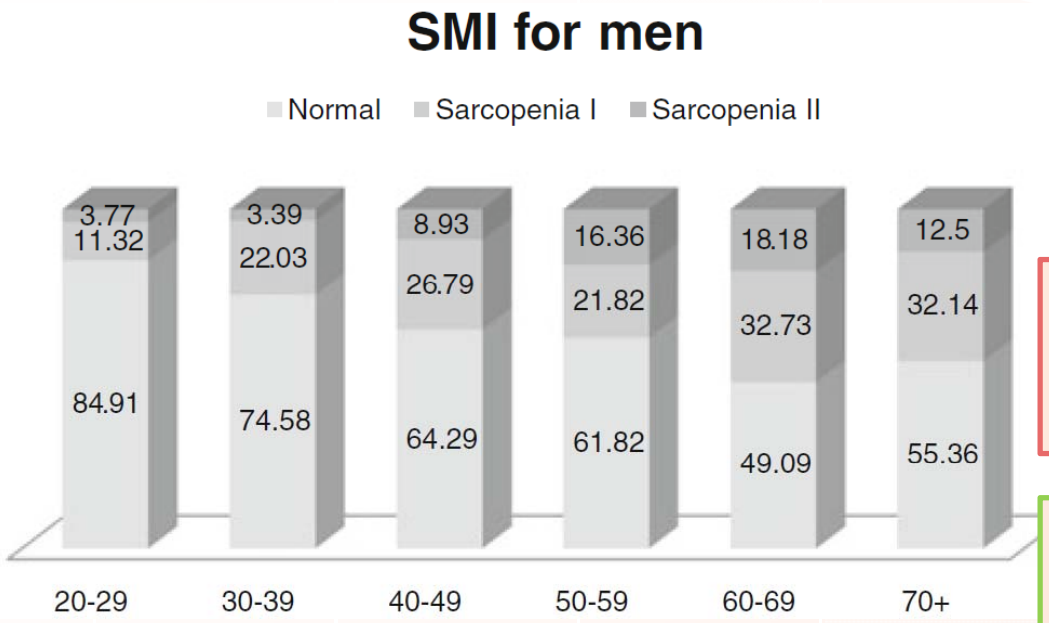


Weight-adjusted sarcopenia by age group and gender



KNHANES	Men	Women
Height (cm)	164.3 (0.4)	151.2 (0.3)
Weight (kg)	62.3 (0.8)	54.6 (0.4)
Waist circumference (cm)	84.7 (0.7)	83.2 (0.5)
Body mass index (kg/m^2)	23.0 (0.2)	23.9 (0.2)
ASM/height^2 (kg/m^2)	7.58 (0.06)	6.18 (0.04)
ASM/weight	33.2 (0.2)	26.1 (0.1)
Prevalence (%)		
Height-adjusted definition		
Class I sarcopenia	30.8 (2.7)	10.2 (1.5)
Class II sarcopenia	12.4 (1.7)	0.1 (0.1)
Sarcopenic obesity	0.2 (0.2)	0.0
Weight-adjusted definition		
Class I sarcopenia	29.5 (3.4)	30.3 (2.5)
Class II sarcopenia	9.7 (2.0)	11.8 (1.9)
Sarcopenic obesity	7.6 (2.0)	9.1 (1.7)

Kim YS, et al. J Gerontol A Biol Sci Med Sci 2012;67(10):1107-13

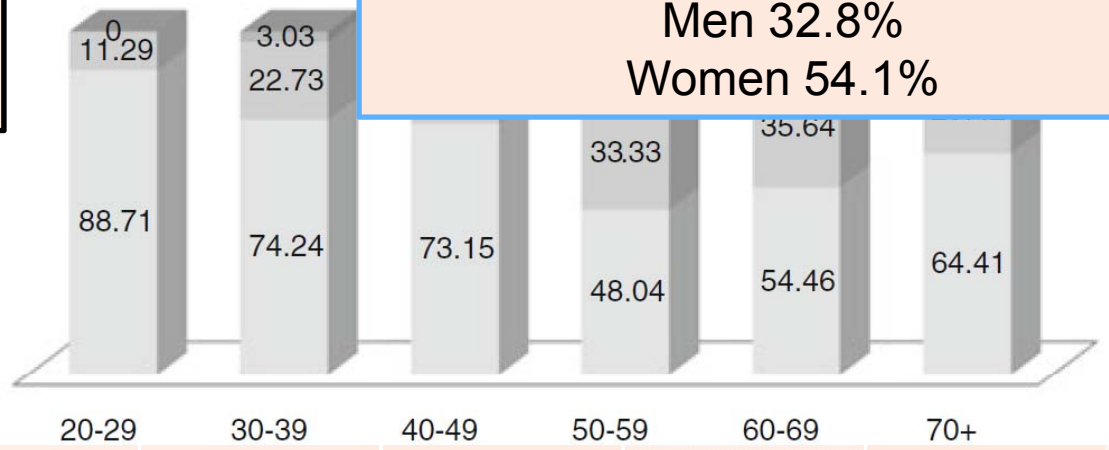


Prevalence of sarcopenia: Khon Kaen
Men 35.3%
Women 34.74%

Prevalence of sarcopenia: KNHANSE
Men 39.2%
Women 42.1%

Prevalence of sarcopenia: EGAT
Men 32.8%
Women 54.1%

SMI =
muscle mass/body mass*100



Pongchaiyakul C. J Bone Miner Metab. 2013 May;31(3):346-50

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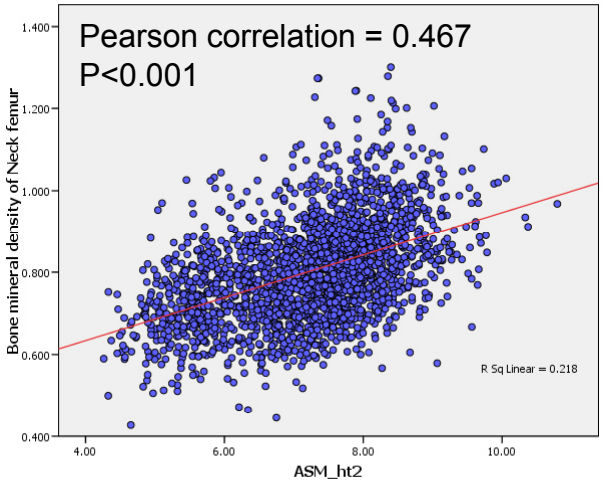
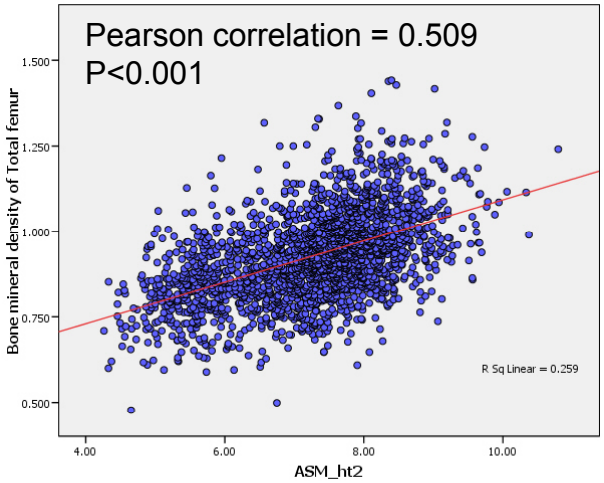
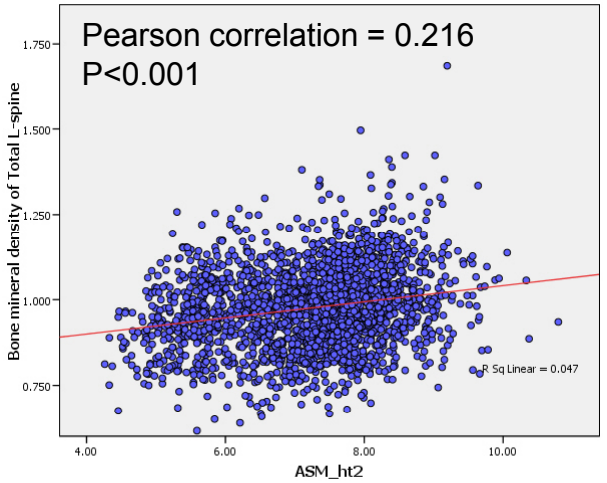
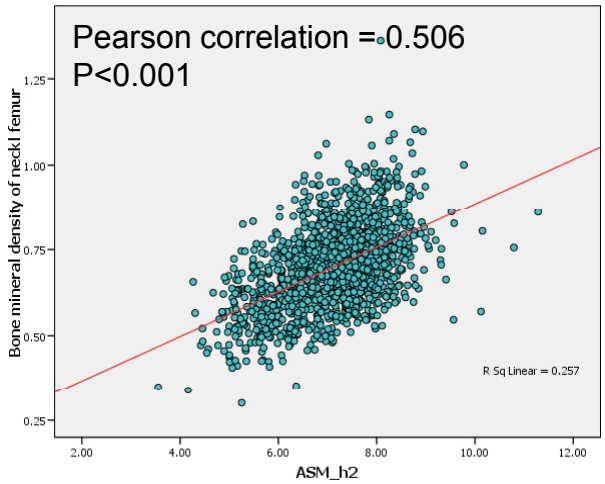
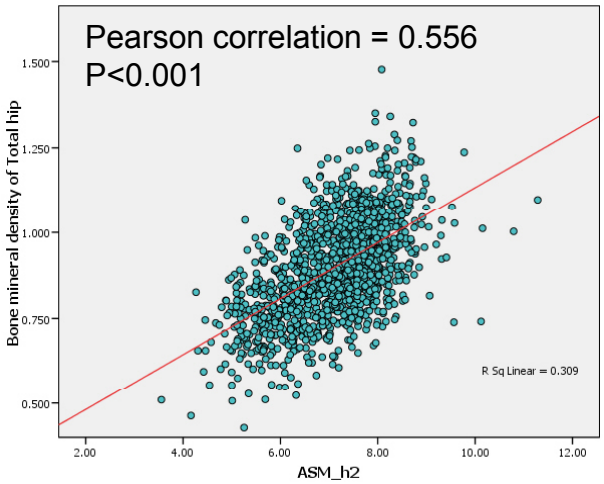
Low muscle mass and BMD

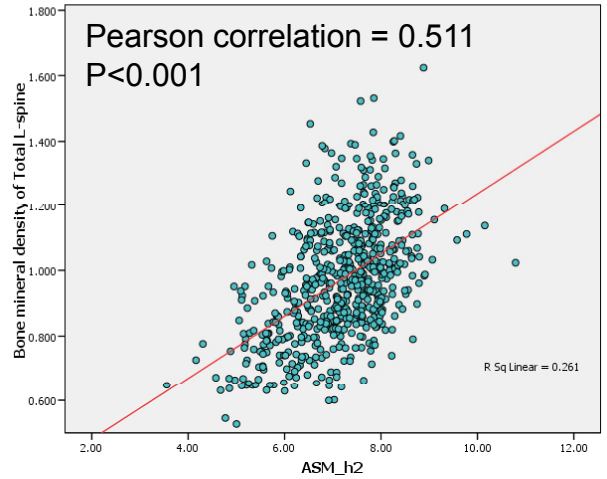




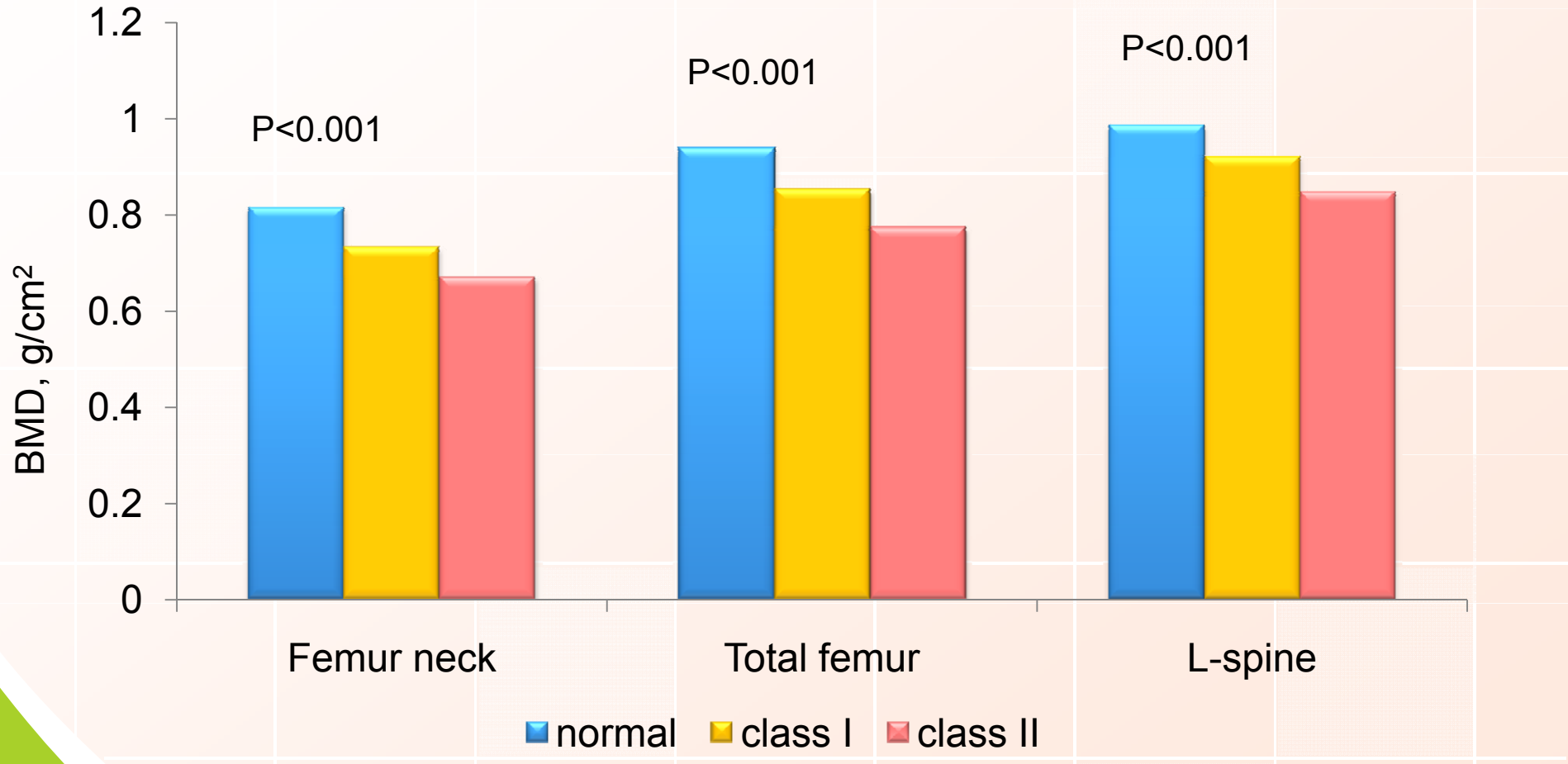






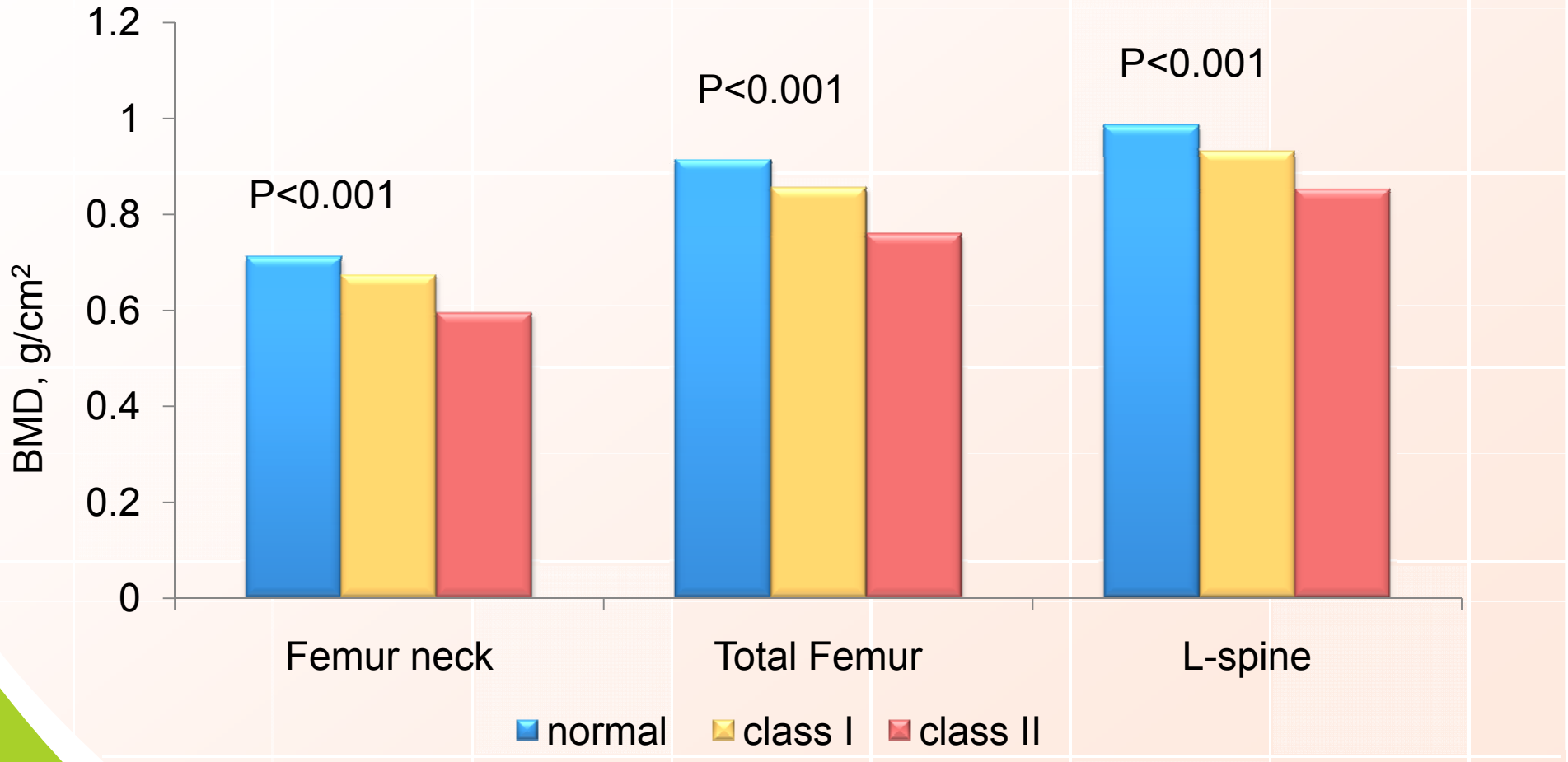


Sarcopenia and BMD: EGAT3/1



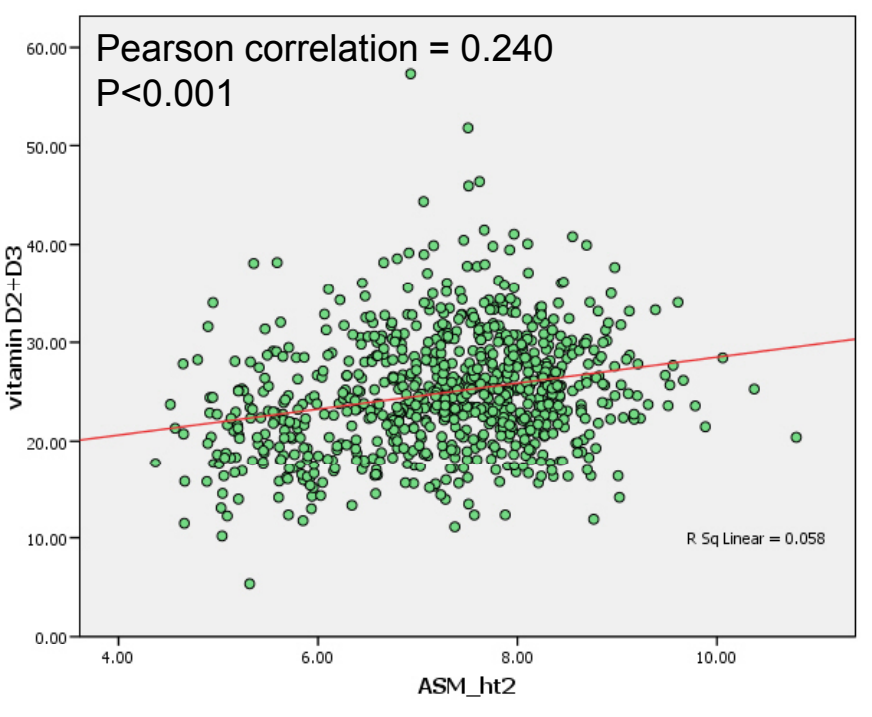
Adjusted for age, sex, physical activity, and BMI

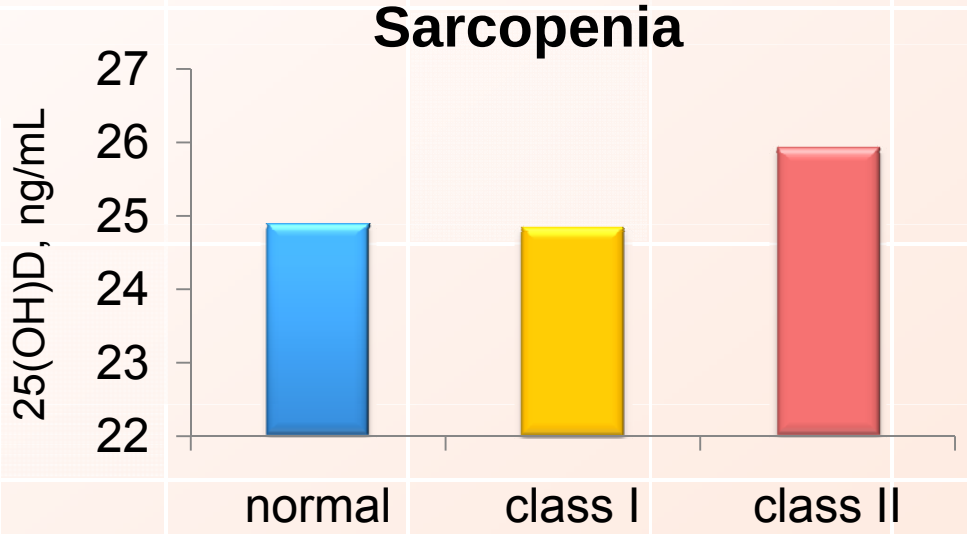
Sarcopenia and BMD: EGAT 1/5

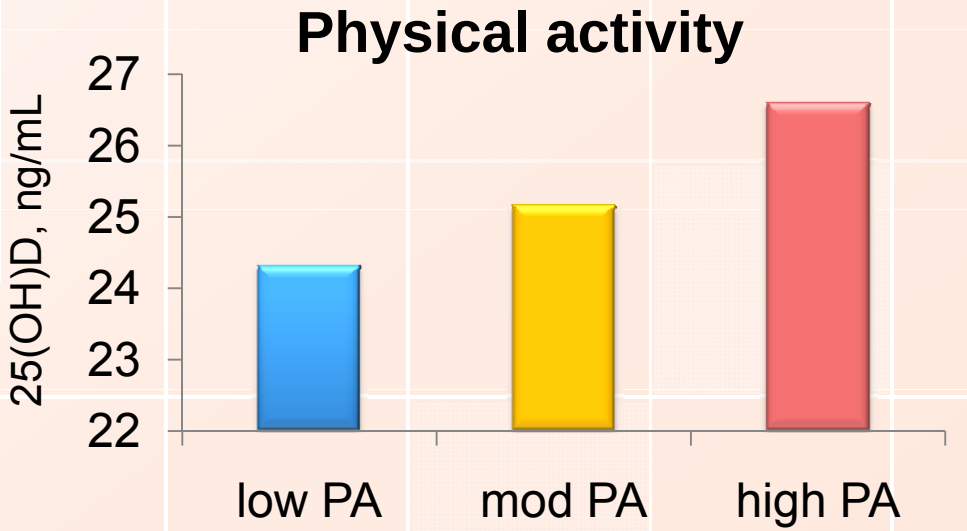


Adjusted for age, sex, and BMI

Vitamin D, Sarcopenia, and PA: EGAT3/1

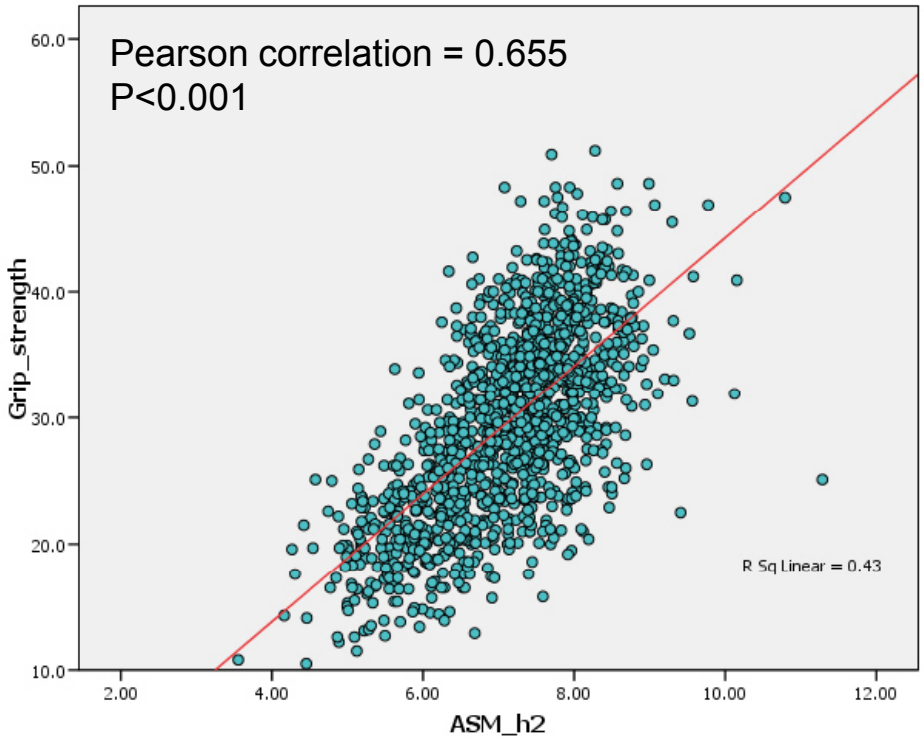


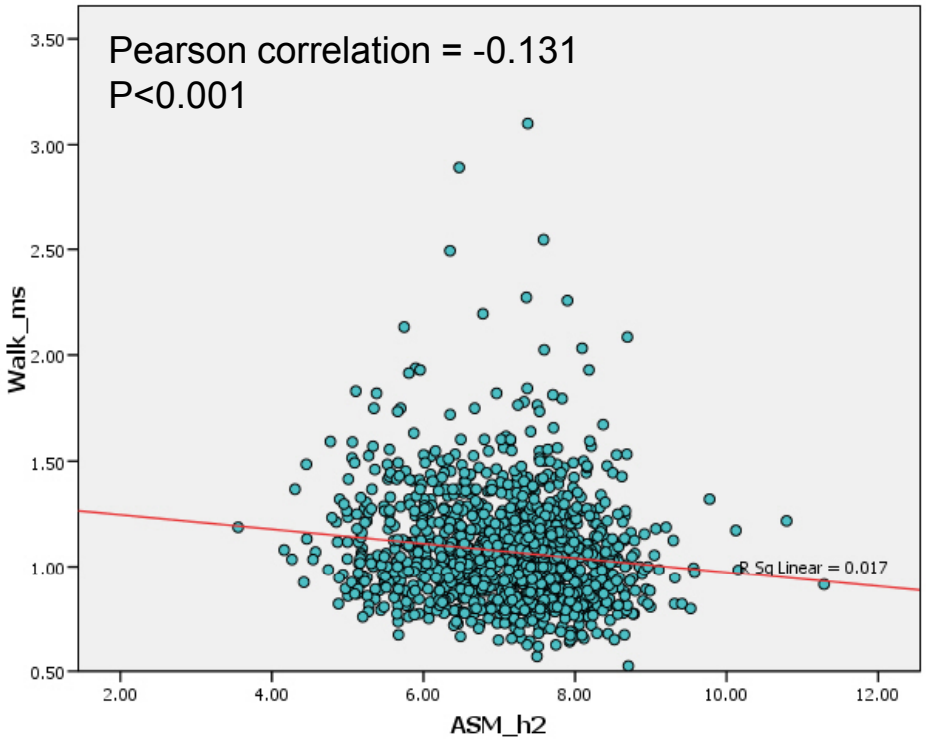




Muscle mass and muscle function

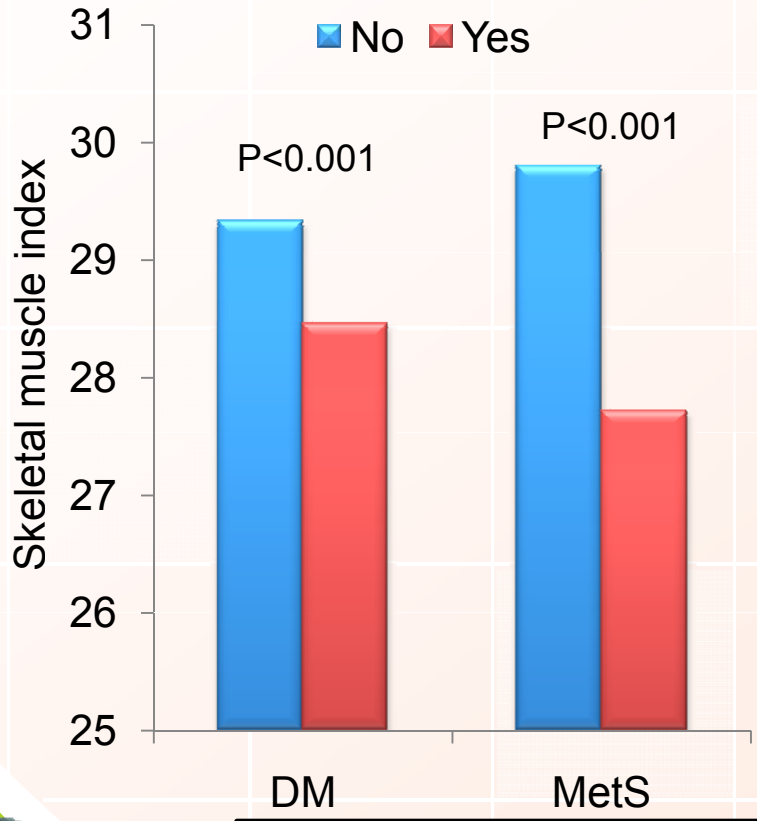
Grip strength	4-m Walk test



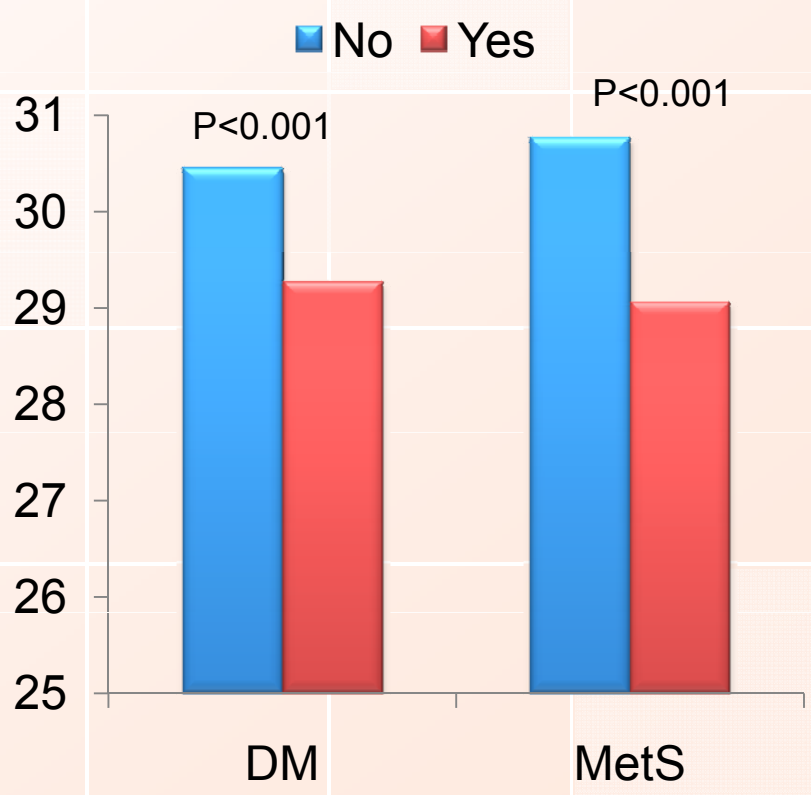


SMI, DM and MetS

EGAT 1/5



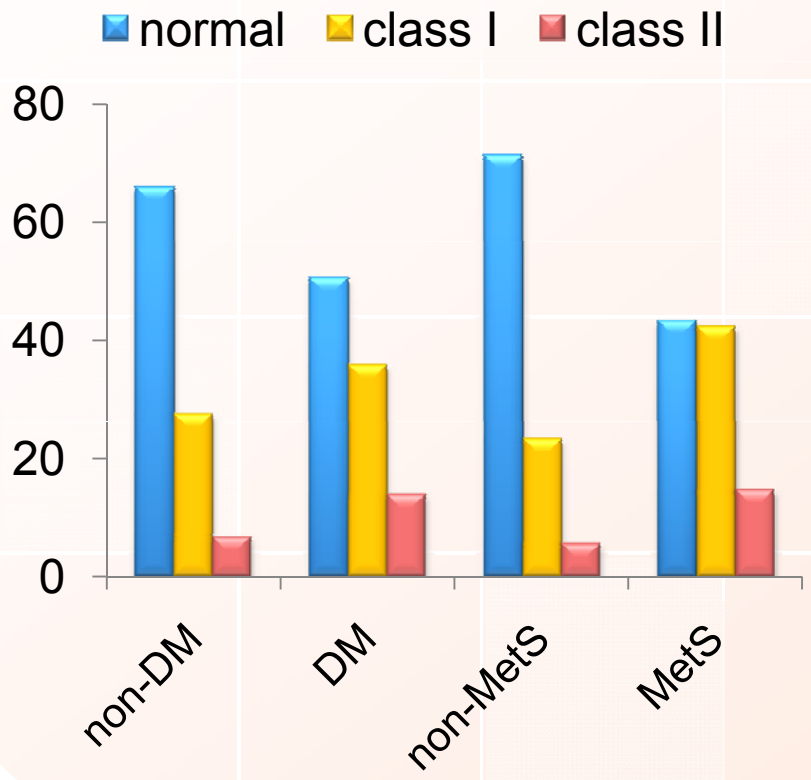
EGAT 3/1



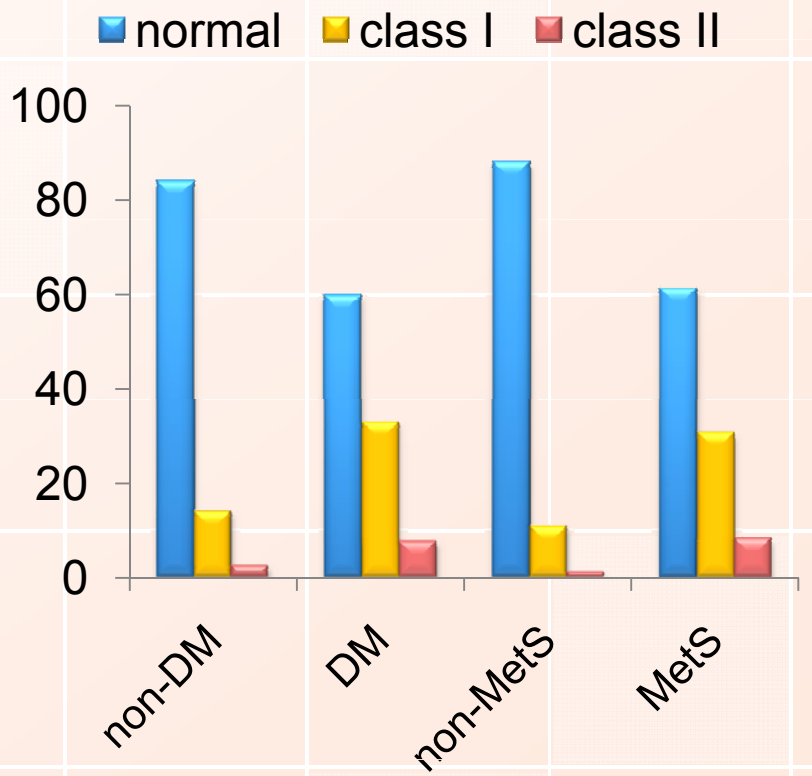
SMI =
muscle mass/body mass*100

Sarcopenia, DM and MetS

EGAT 1/5



EGAT 3/1



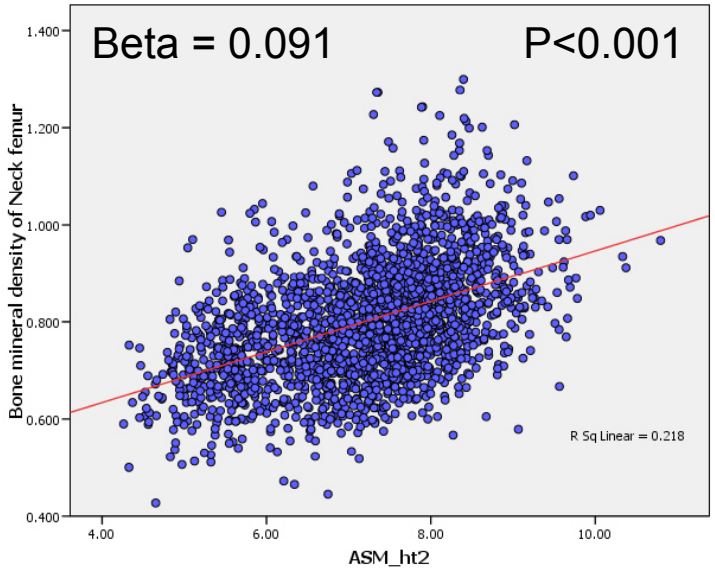
Conclusion

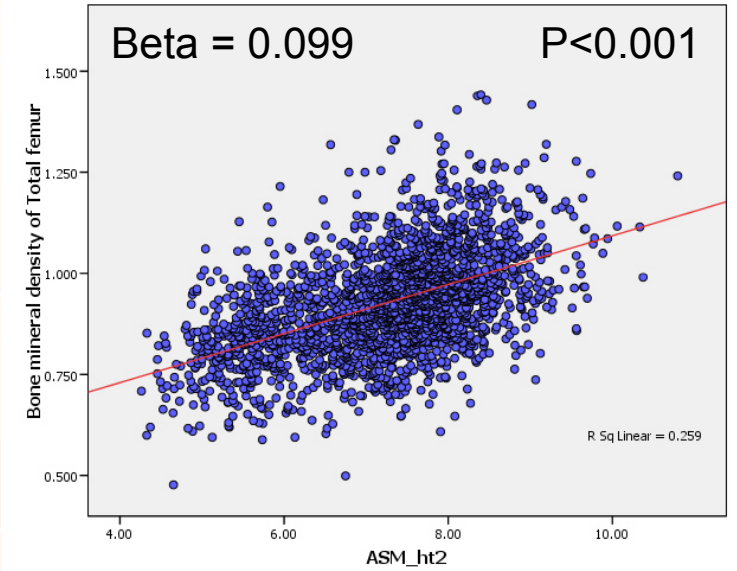
- The weight-adjusted sarcopenia is more sensitive compared with height-adjusted sarcopenia
- The prevalence of weight-adjusted sarcopenia in the elderly was 39.2% and 42.1% in men and women, respectively
- The prevalence of height-adjusted sarcopenia in the elderly was 25.7% and 17.1% in men and women, respectively
- Sarcopenia was associated with BMD and vitamin D levels
- Sarcopenia was associated with DM and Metabolic syndrome

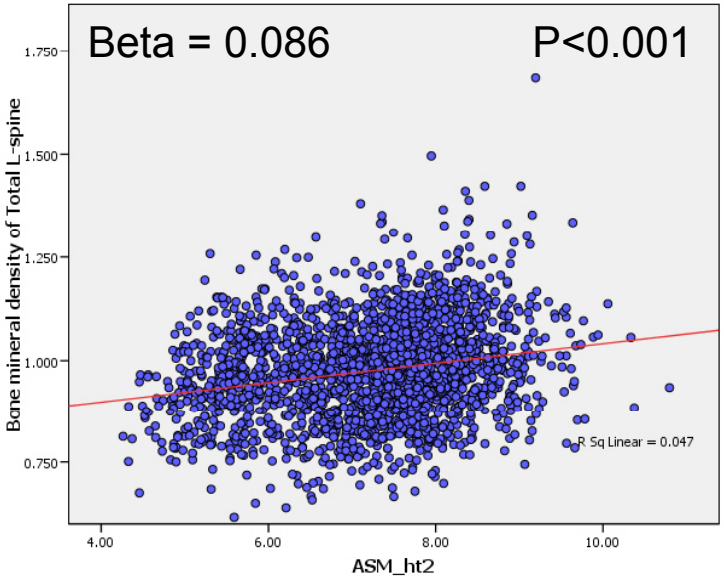
Demographic Data in elderly

	Men (N=1046)	Female (N=364)
Age (y)	69±4.7	68.1±4.1
Height (cm)	164.2±7.3	152.9±4.9
Weight (kg)	66.7±10.2	57.7±10
Waist circumference (cm)	89.9±10.7	85.8±10
Body mass index (kg/m^2)	24.6±3.4	24.6±4.1
ASM/Ht (kg/m^2)	7.5±0.7	6.0±0.8
ASM/wt	30.6±2.9	24.6±2.8
Height adjusted sarcopenia (%)		
• Normal	74.4	87.6
• Class I Sarcopenia	20.5	11.3
• Class II sarcopenia	5.2	4.59
Weight-adjusted sarcopenia (%)		
• Normal	67.2	45.9
• Class I Sarcopenia	26.4	39
• Class II sarcopenia	6.4	15.1

Sarcopenia BMD and 25(OH)D







Linear regression model
Adjusted for
age, sex, physical activity, and BMI

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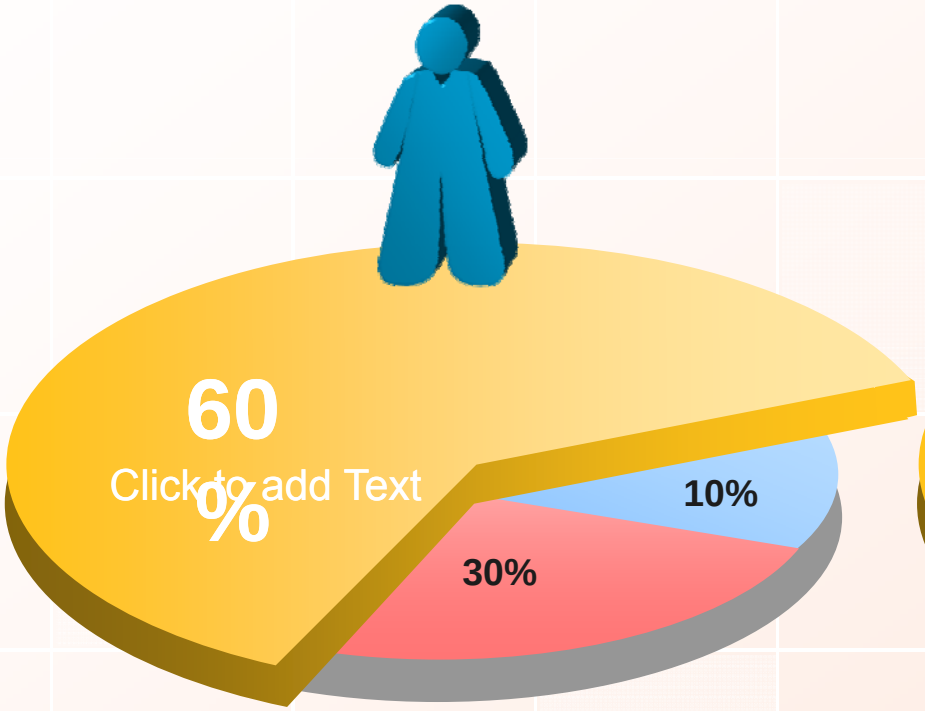

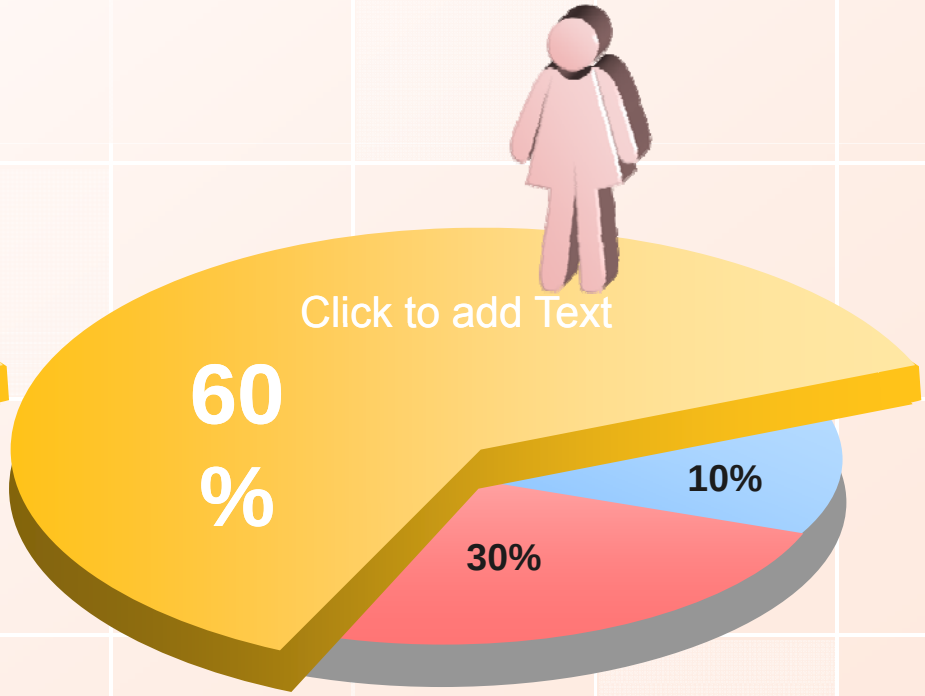

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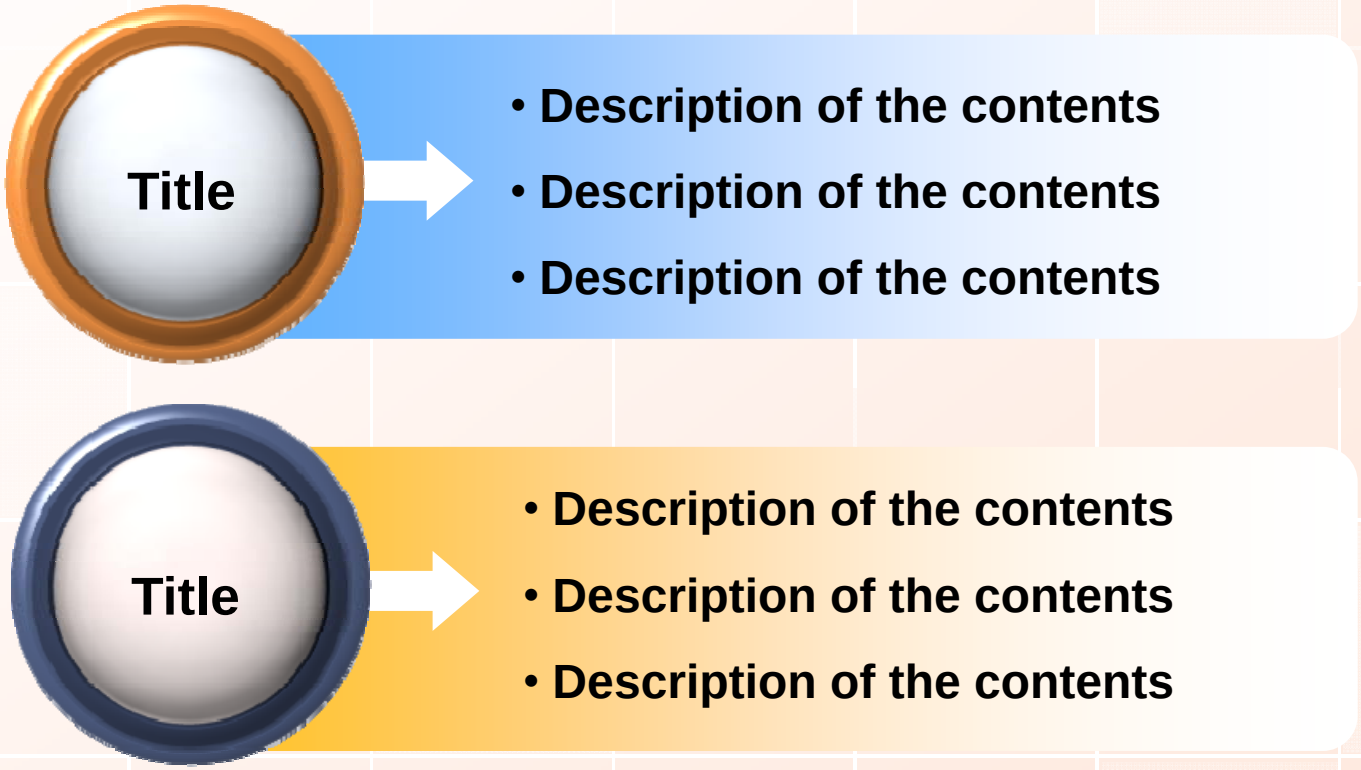


- Aging is associated with a loss of skeletal muscle mass and a decline in muscle function [1].
- The decline in muscle mass is 1–2 % per year after about age 50, whereas muscle strength decreases faster, at a rate of 1.5 % per year between ages 50 and 60 and subsequently at 3 % per year.
- A diagnosis of sarcopenia is consistent with a gait speed of less than 1 m/s and an objectively measured low muscle mass

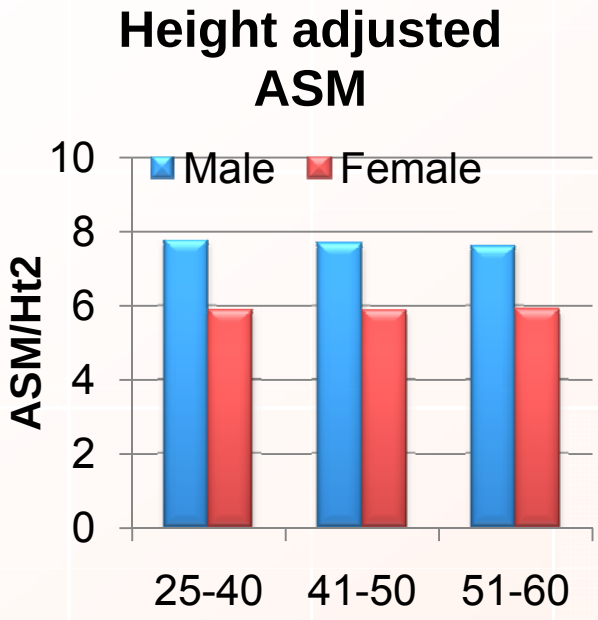
Characteristic of The young Reference group (EGAT 3/1)

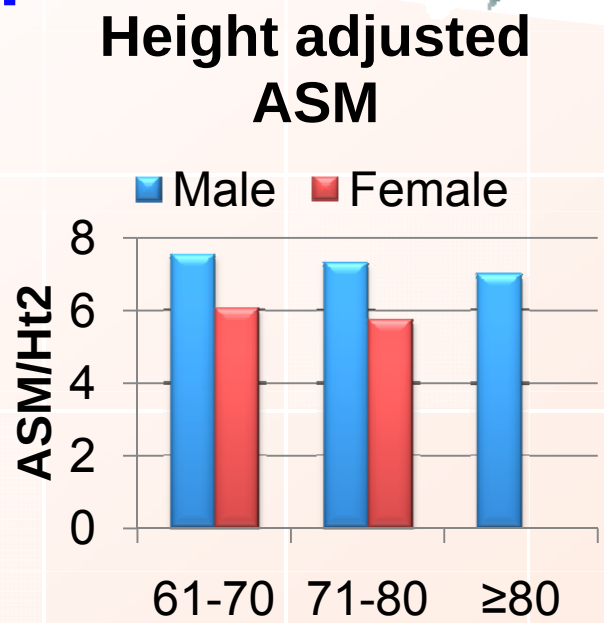
Young Reference Group

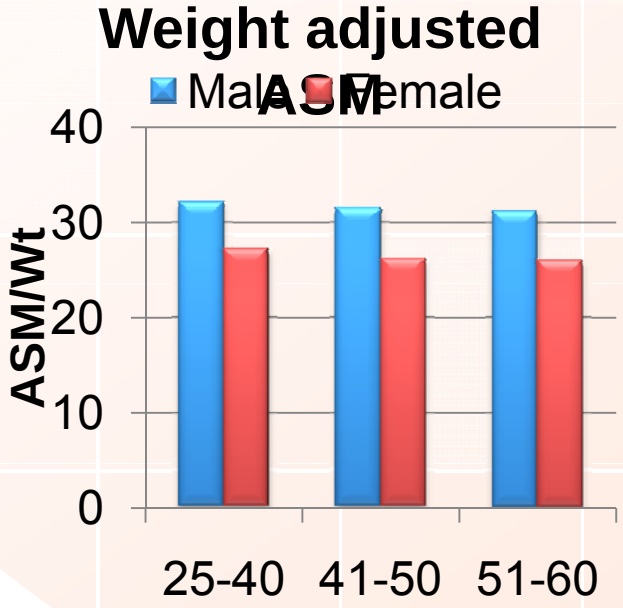
	Young Reference Group (N = 2,513)	
	Men (N = 1,245)	Women (N = 1,268)
Age (y)	31.0 ± 5.5	30.8 ± 5.6
Height (cm)	173.4 ± 5.8	160.4 ± 5.4
Weight (kg)	72.2 ± 11.1	56.9 ± 9.7
Waist circumference (cm)	82.6 ± 9.2	74.0 ± 9.6
Body mass index (kg/m^2)	24.0 ± 3.4	22.1 ± 3.5
ASM/height^2 (kg/m^2)	8.42 ± 0.92	6.18 ± 0.79
ASM/weight	35.4 ± 3.1	28.1 ± 2.6
Cutoff values for height-adjusted definition (kg/m^2)		
Class I sarcopenia	7.50	5.38
Class II sarcopenia	6.58	4.59
Cutoff values for weight-adjusted definition		
Class I sarcopenia	32.2	25.6
Class II sarcopenia	29.1	23.0

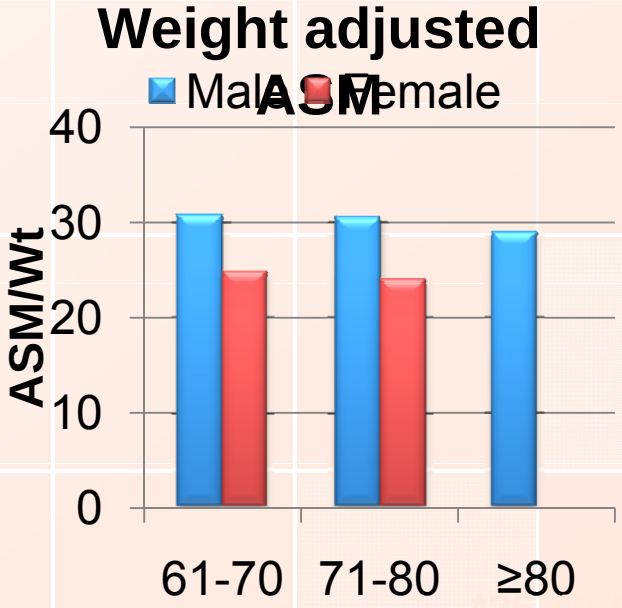
- Class I Sarcopenia 5.140 24.657

ASM in population

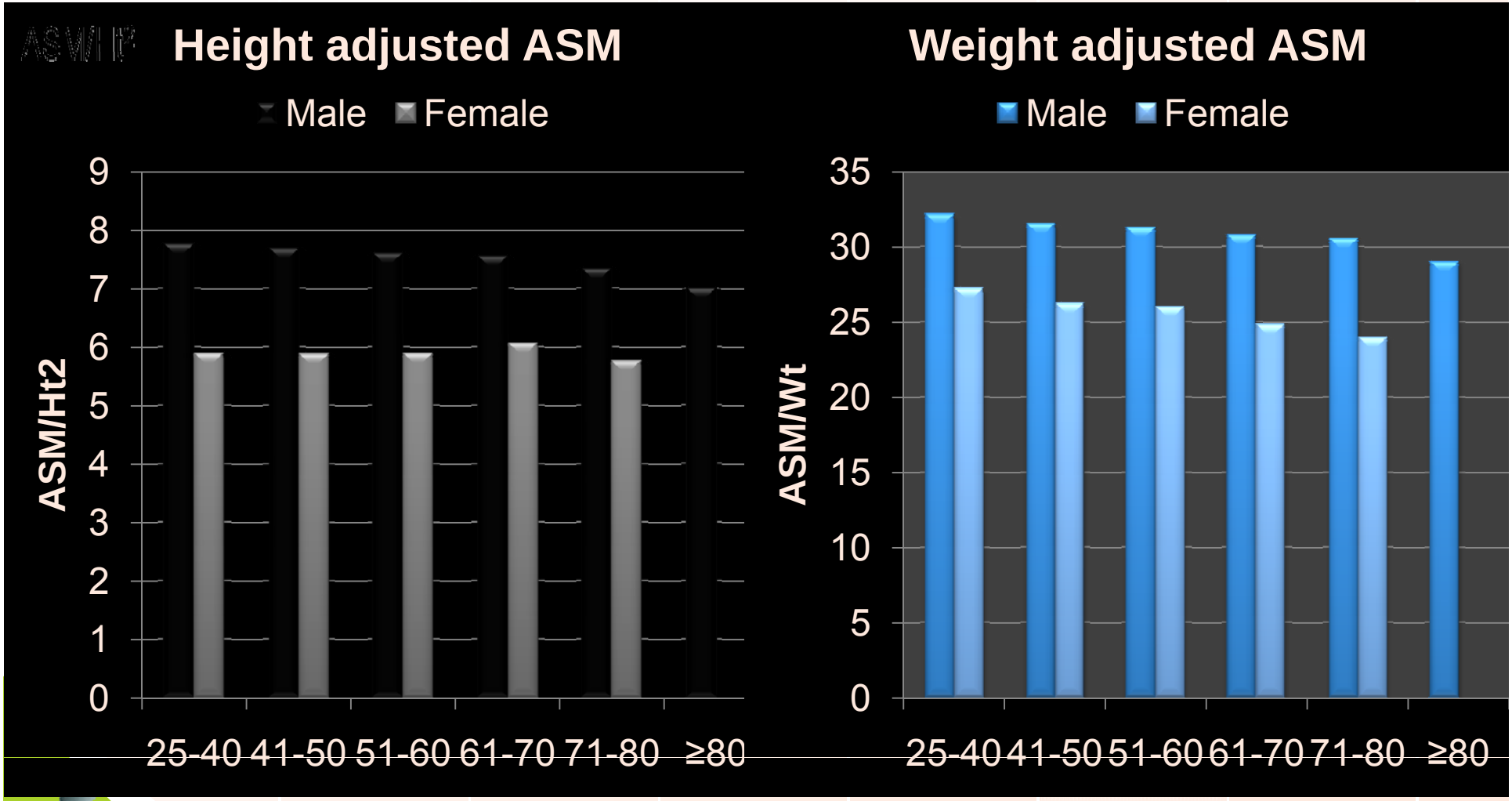








ASM in population



Prevalence of Low muscle mass

Definition		% of prevalence			
		Height-adjusted		Weight-adjusted	
Class	N	Class I	Class II	Class I	Class II
Men					
• 25-40	747	Reference			
• 41-50	734	13.6	2.6	14	2.6
• 51-60	112	8.7	0	20.5	3.6
Female					
• 25-40	333	Reference			
• 41-50	226	11.5	0.9	22.2	4.9
• 51-60	44	11.4	2.3	22.7	9.1

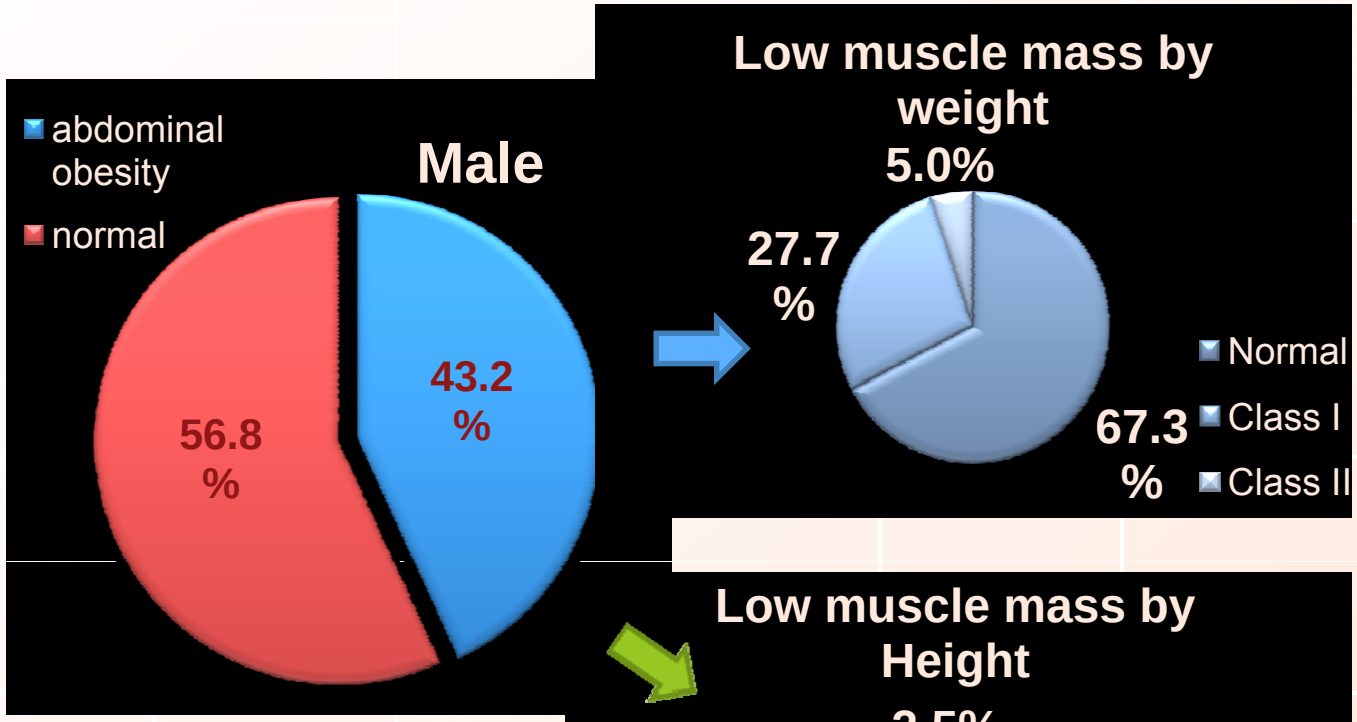
Young Adult (EGAT 3/1)

Young Adult (EGAT 3/1)

Elderly (EGAT 1/15)

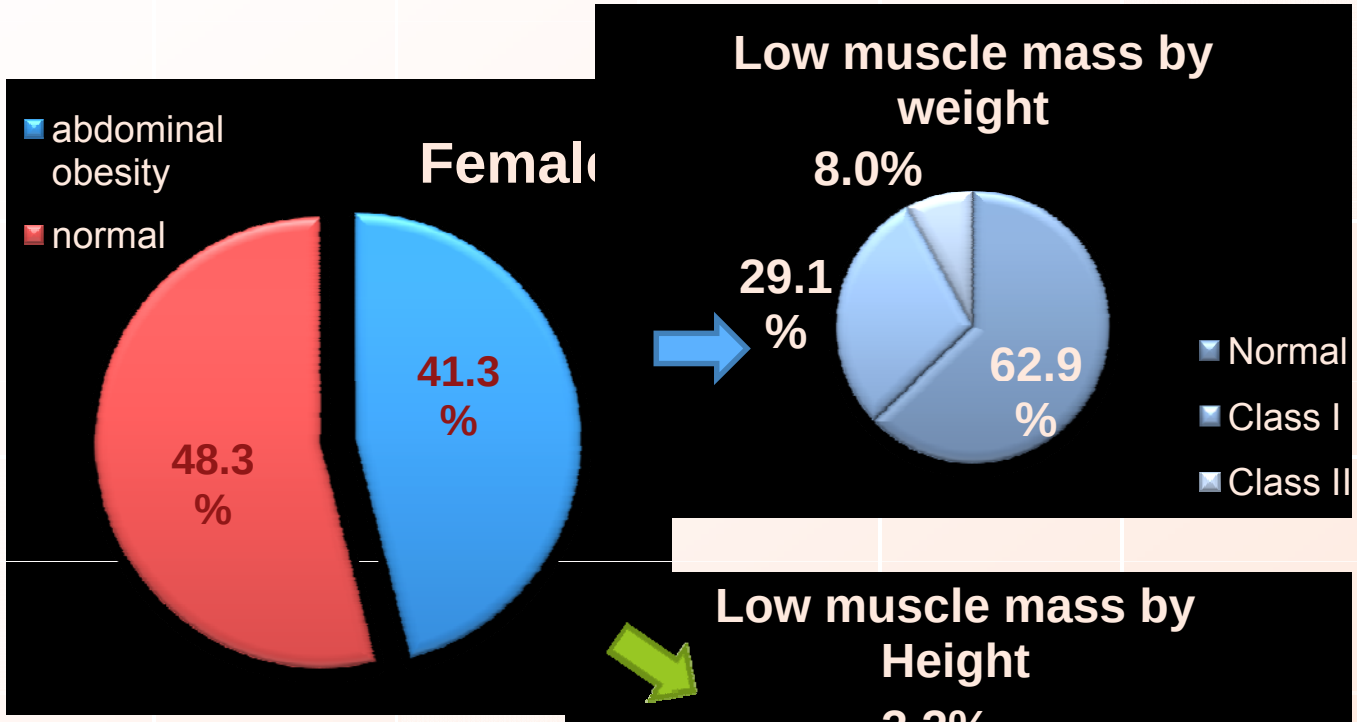
Definition		% of prevalence			
		Height-adjusted		Weight-adjusted	
Class	N	Class I	Class II	Class I	Class II
Men					
• 61-70	667	16.5	4.2	24.3	5.8
• 71-80	365	26.8	6.8	29.6	6.8
• ≥ 81	12	41.7	8.3	41.7	16.7
Female					

Low muscle mass in obesity



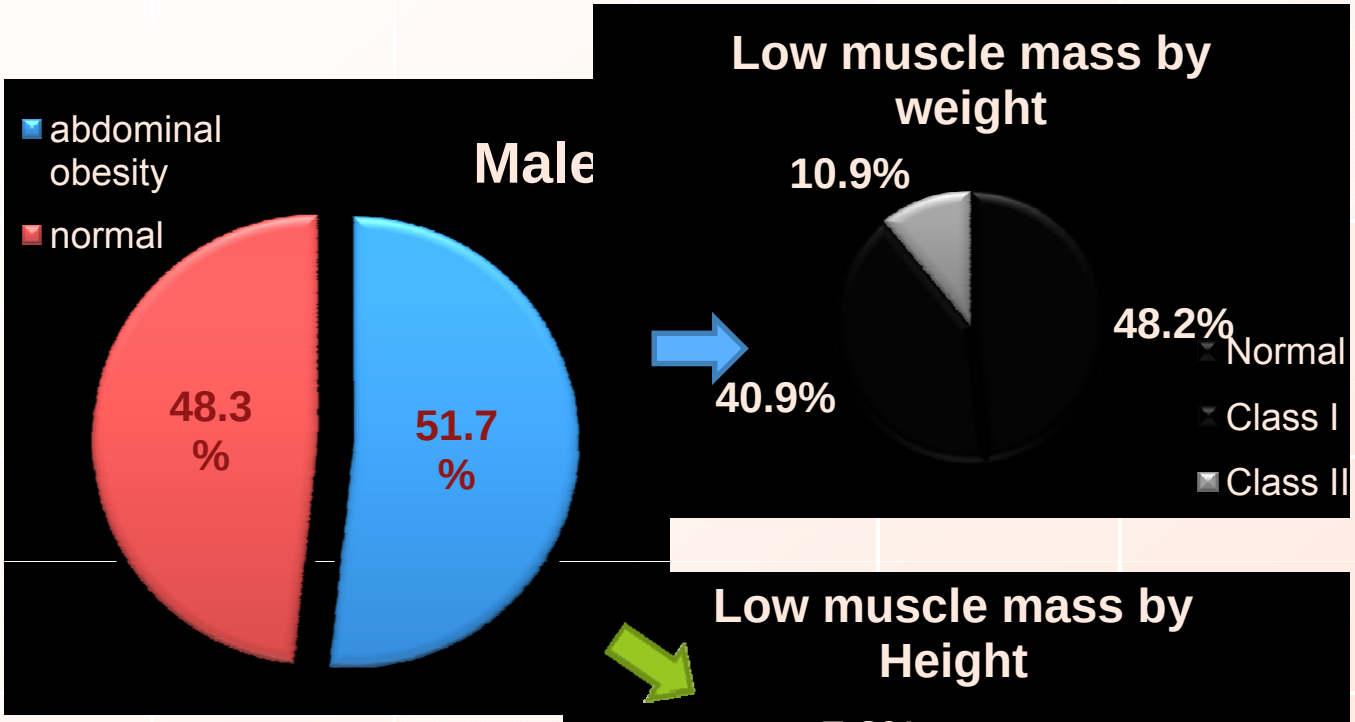
Adult Male (25-60) EGAT 3/1

Low muscle mass in obesity



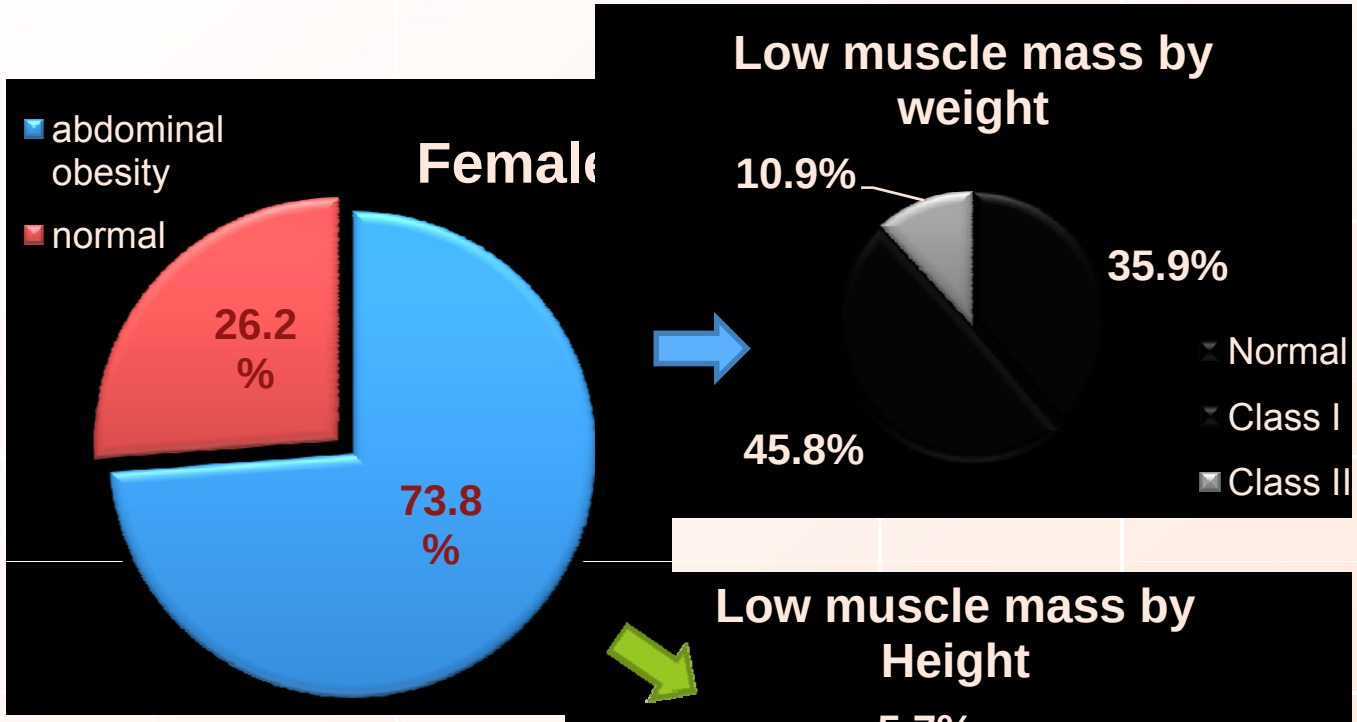
Adult Female (25-60) EGAT 3/1

Low muscle mass in obesity



Elderly Male >60 EGAT 1/5

Low muscle mass in obesity



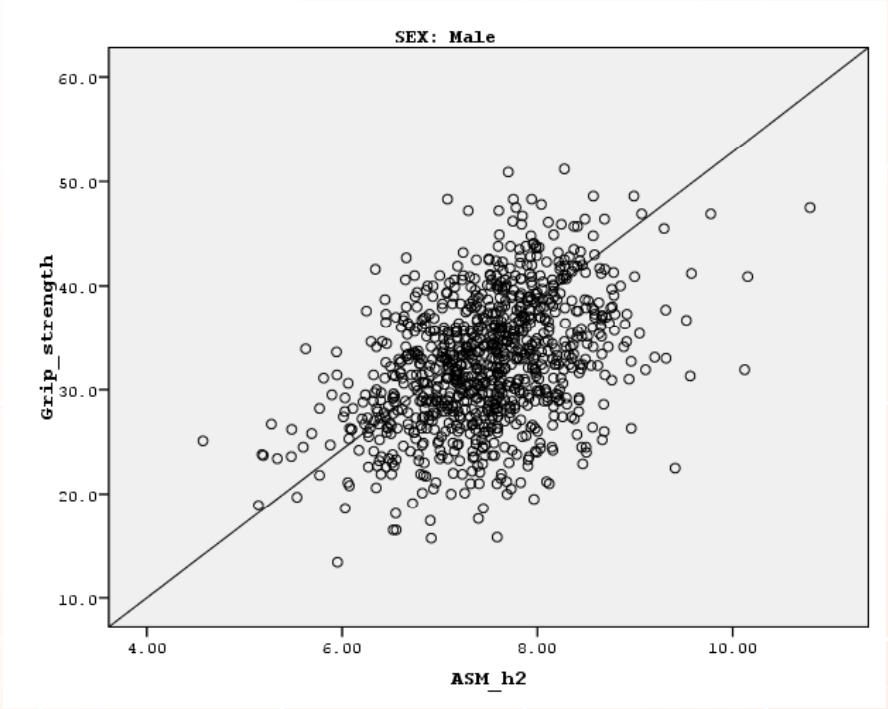
Elderly Female >60 EGAT 1/5

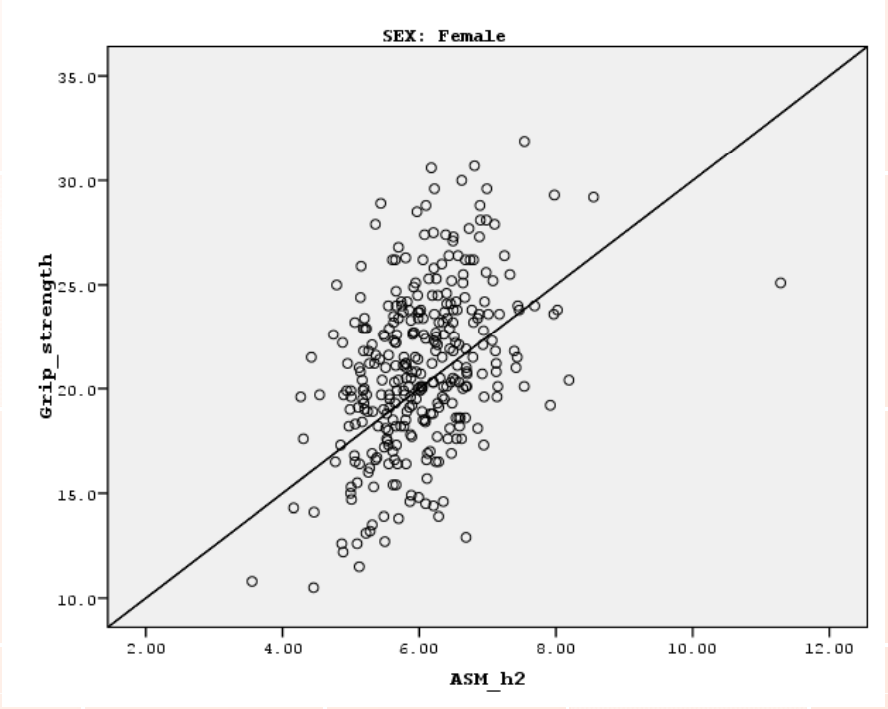
Low muscle mass and BMD

Partial correlations Adjusted by age EGAT 1/5							
SEX			ASM_h2	BMD L3	BMD Neck of femur	BMD total hip	BMD Total body
Male	ASM_h2	Correlation	1.000	0.302	0.356	0.403	0.345
		Significance (2-tailed)	.	0.000	0.000	0.000	0.000
		df	0	498	498	498	498
Female	ASM_h2	Correlation	1.000	0.460	0.436	0.477	0.503
		Significance (2-tailed)	.	0.000	0.000	0.000	0.000
		df	0	140	140	140	140

Partial correlation adjusted by age EGAT 3/1						
SEX			ASM_h2	BMD of Total L-spine	BMD of Neck femur	Bone BMD of Total femur
Male	ASM_h2	Correlation	1.000	0.275	0.399	0.399
		Significance (2-tailed)	.	0.000	0.000	0.000
		df	0	1,582	1,582	1,582
Female	ASM_h2	Correlation	1.000	0.362	0.446	0.375
		Significance (2-tailed)	.	0.000	0.000	0.000
		df	0	599	599	599

Grip and ASM/h^2





MALE

FEMALE

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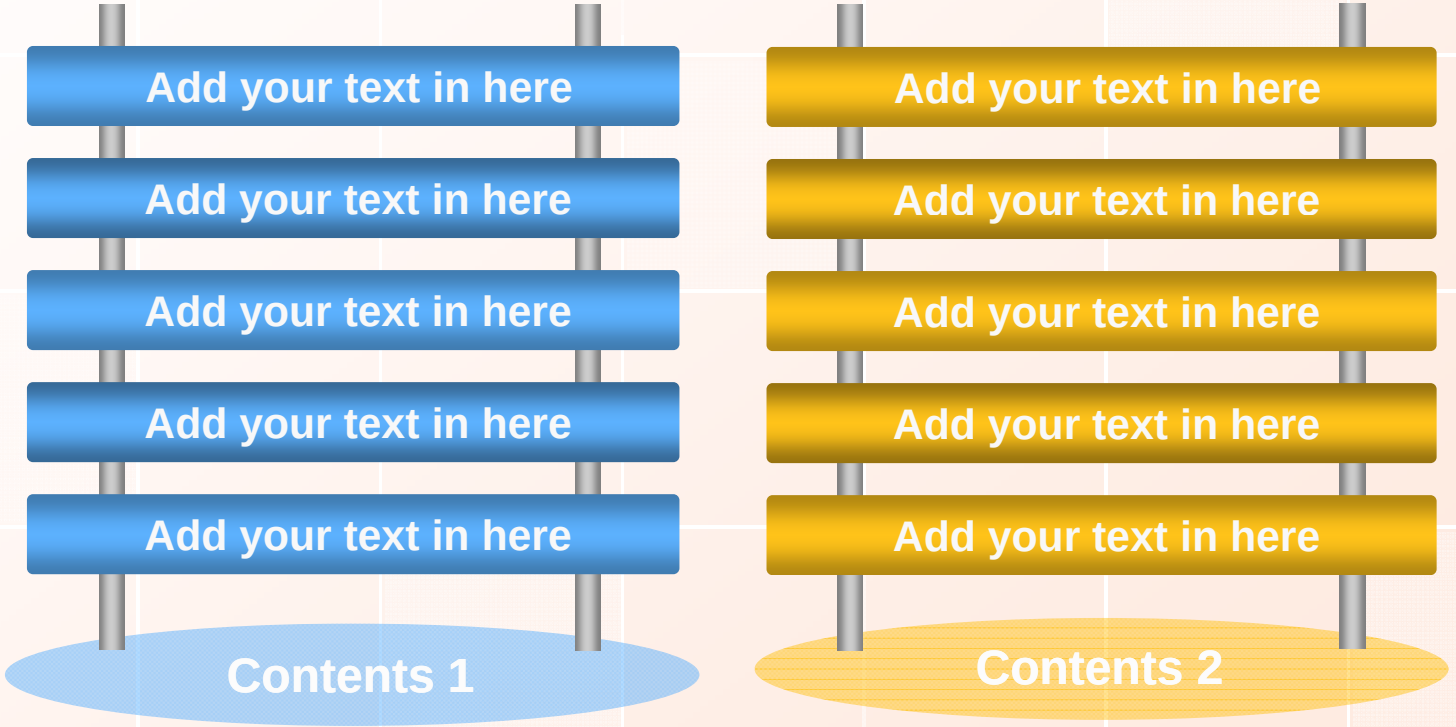

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- How do I incorporate my logo to a slide that will apply to all the other slides?
  - On the [View] menu, point to [Master], and then click [Slide Master] or [Notes Master]. Change images to the one you like, then it will apply to all the other slides.

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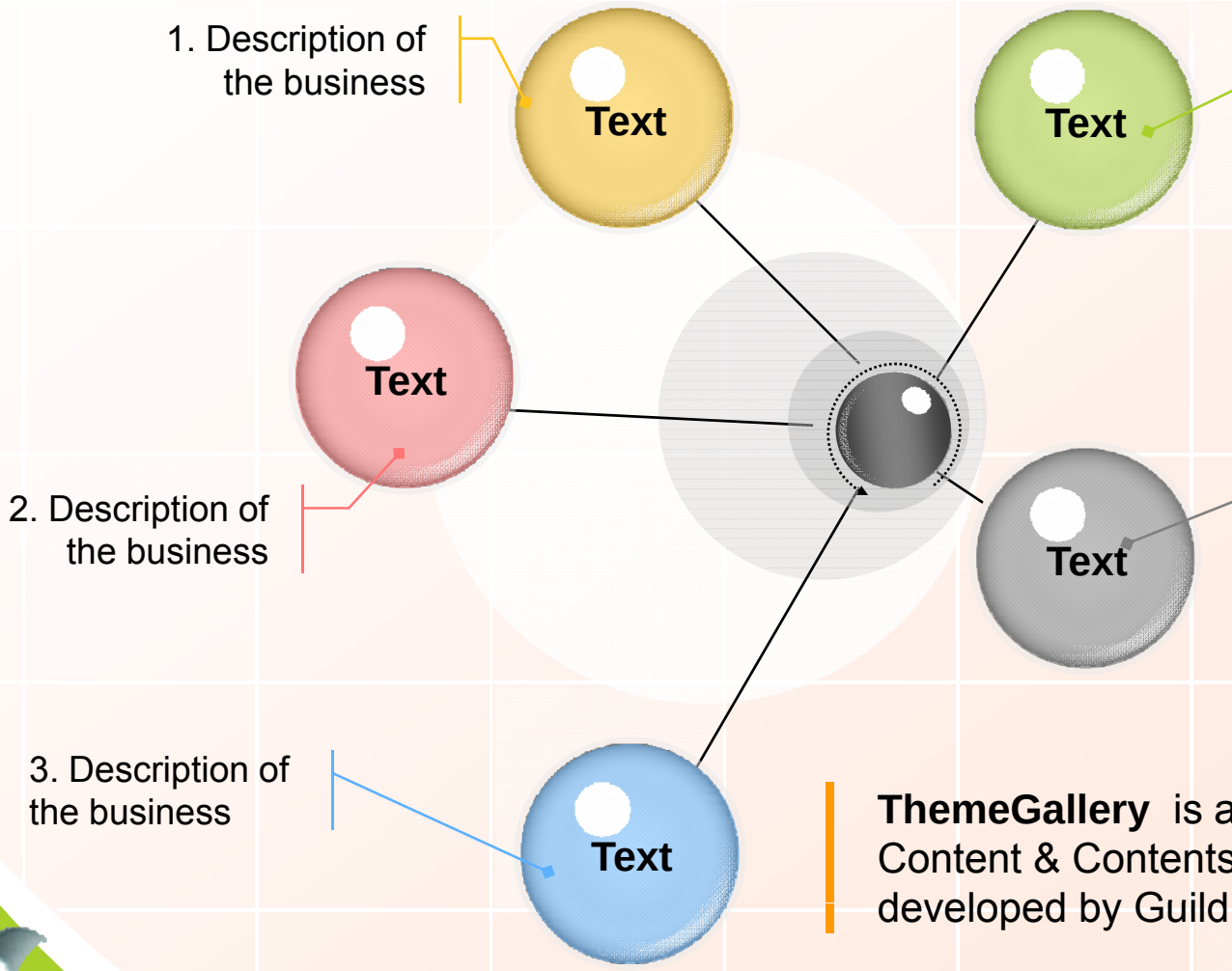

1. Description of the business

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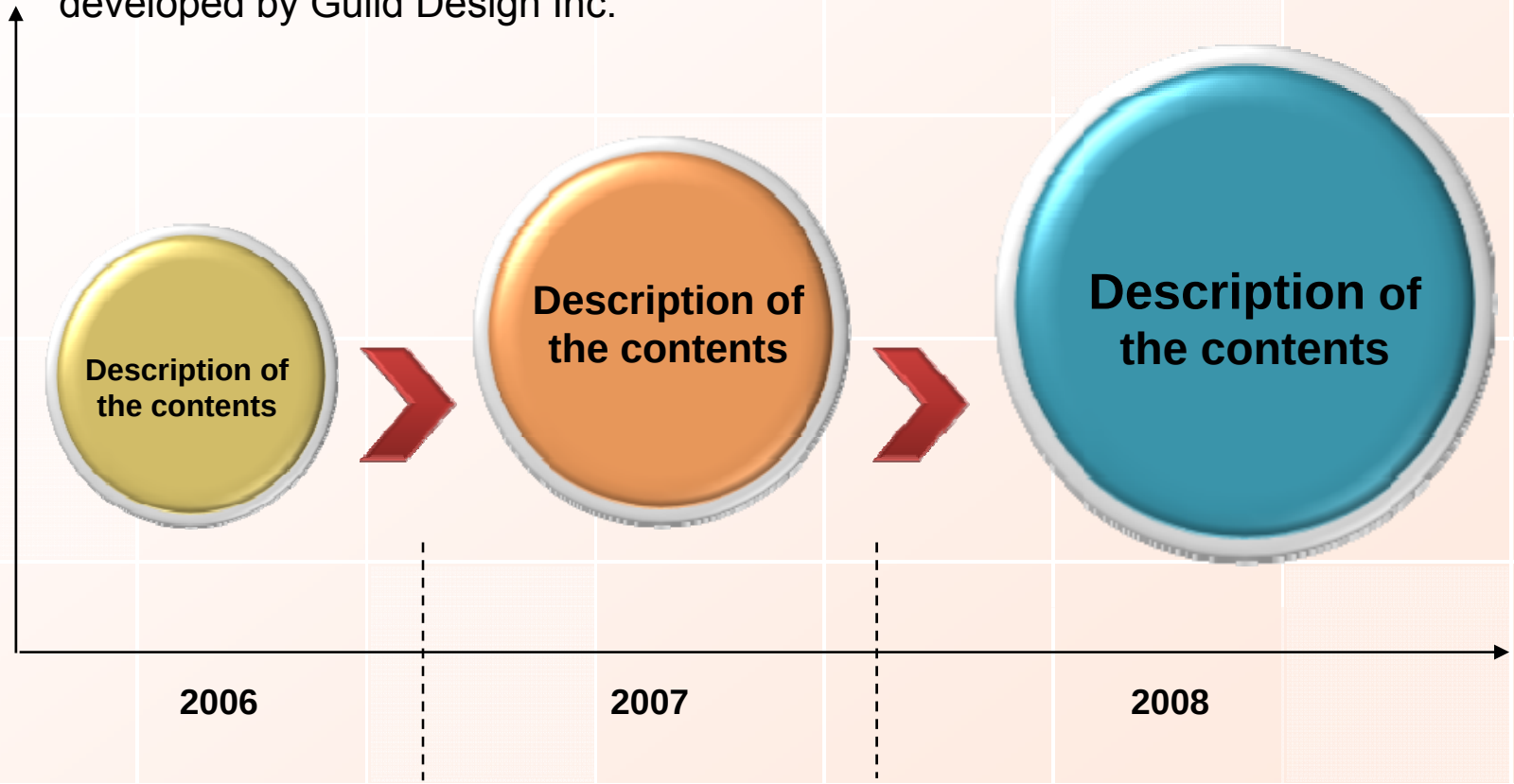

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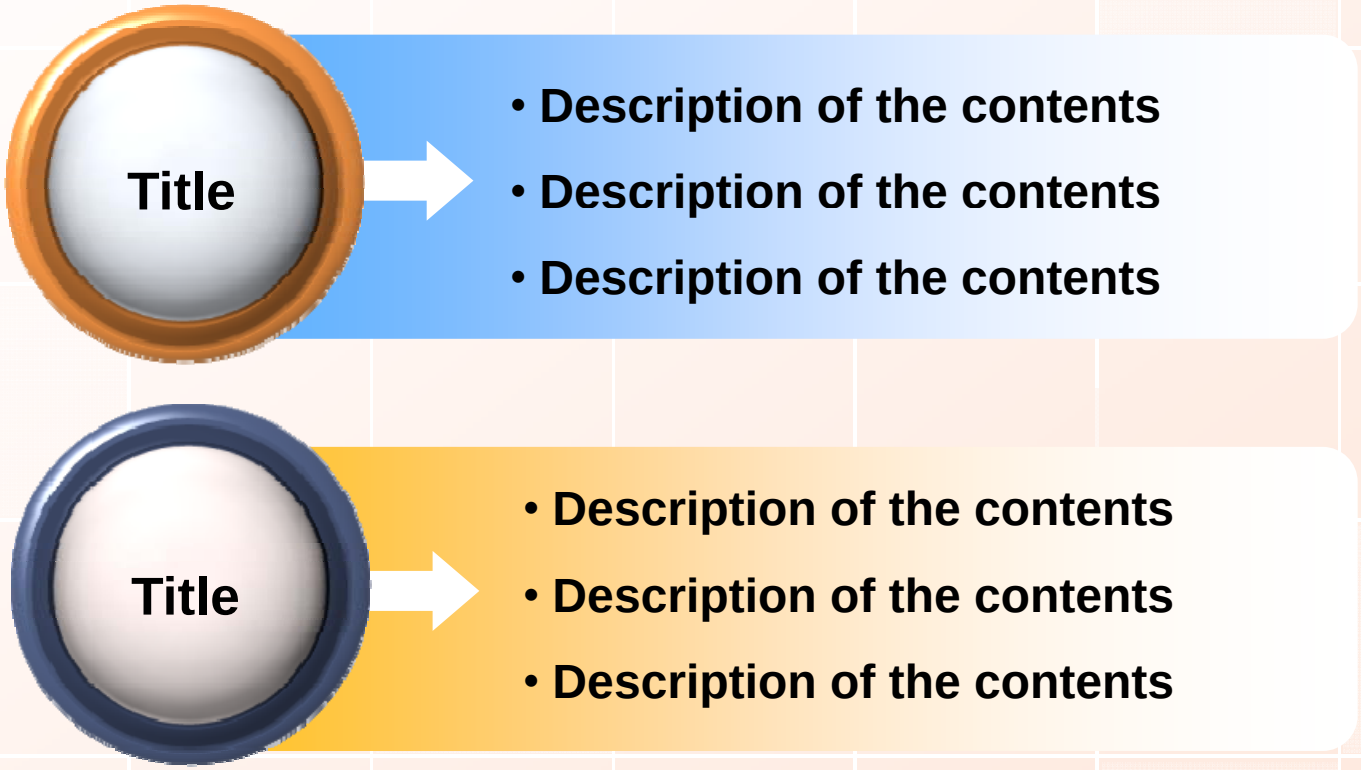

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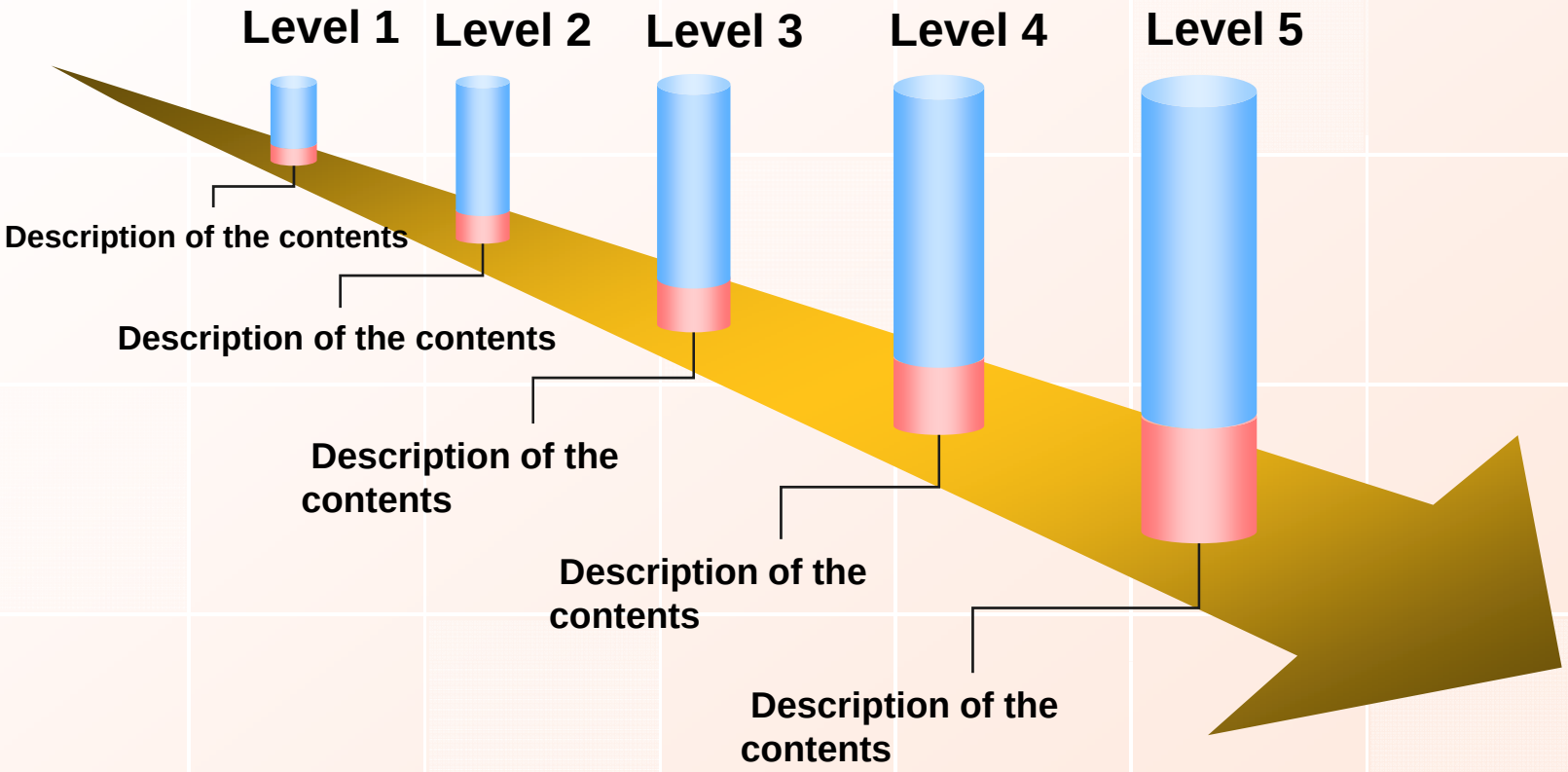

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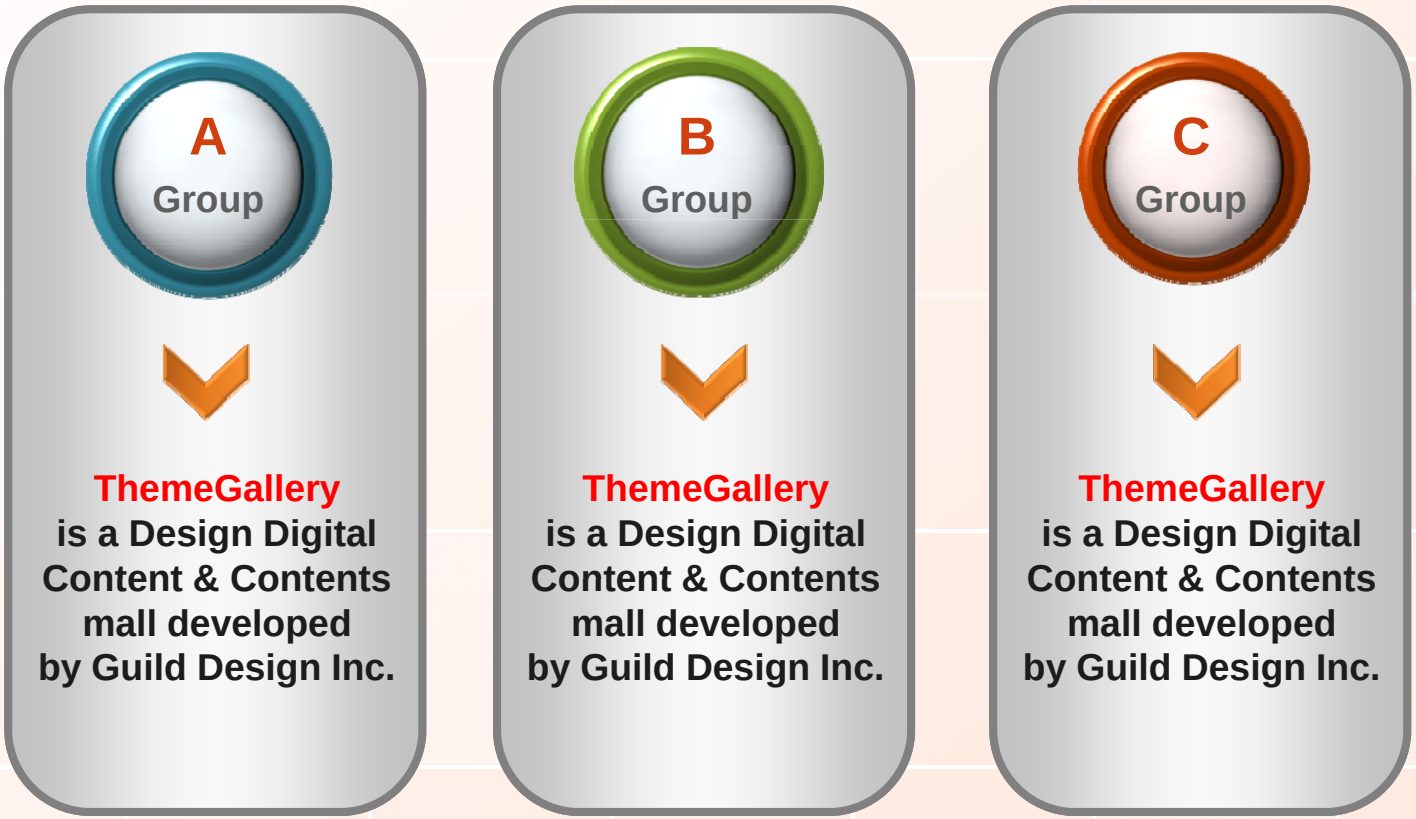

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Products

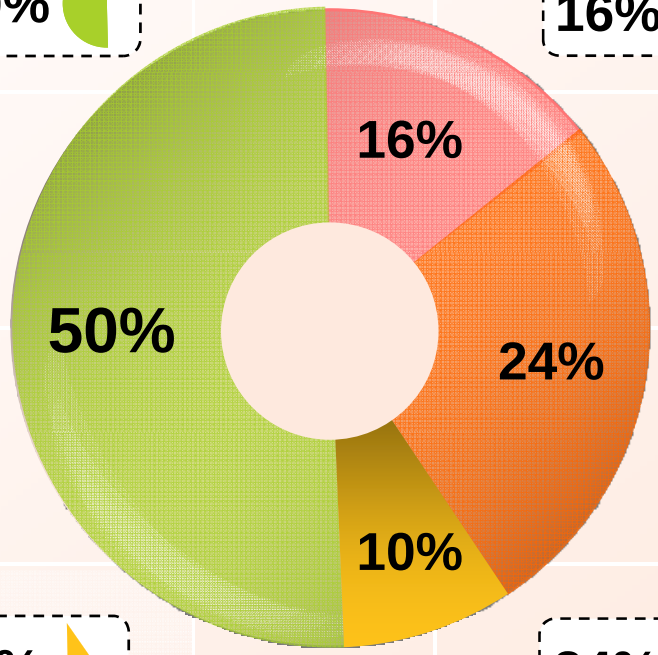
Description of the company's products

50%

Market

16%

Description of the company's market



Technology

Description of the company's technology

10%

Service

24%

Description of the company's service

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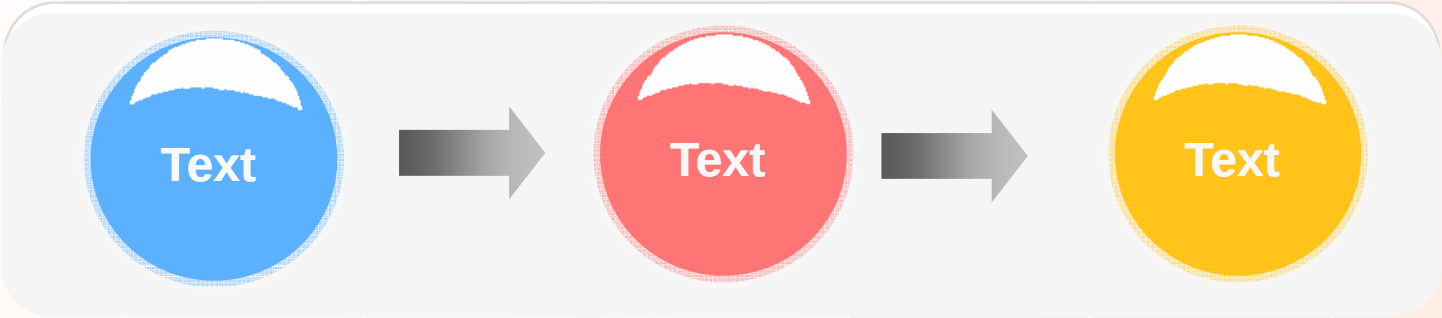

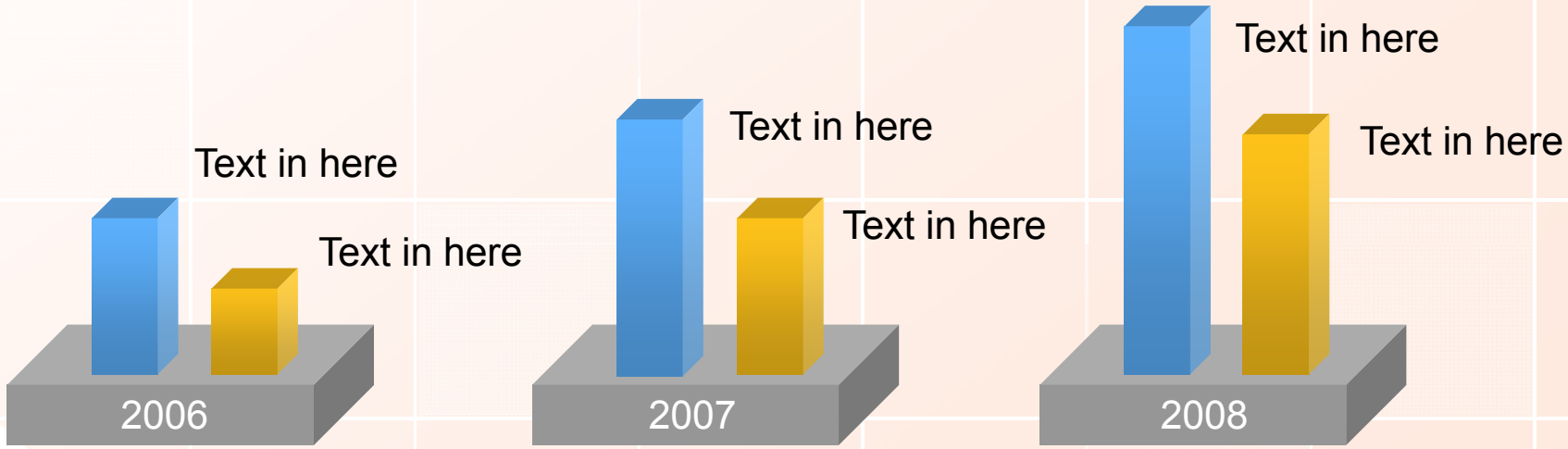

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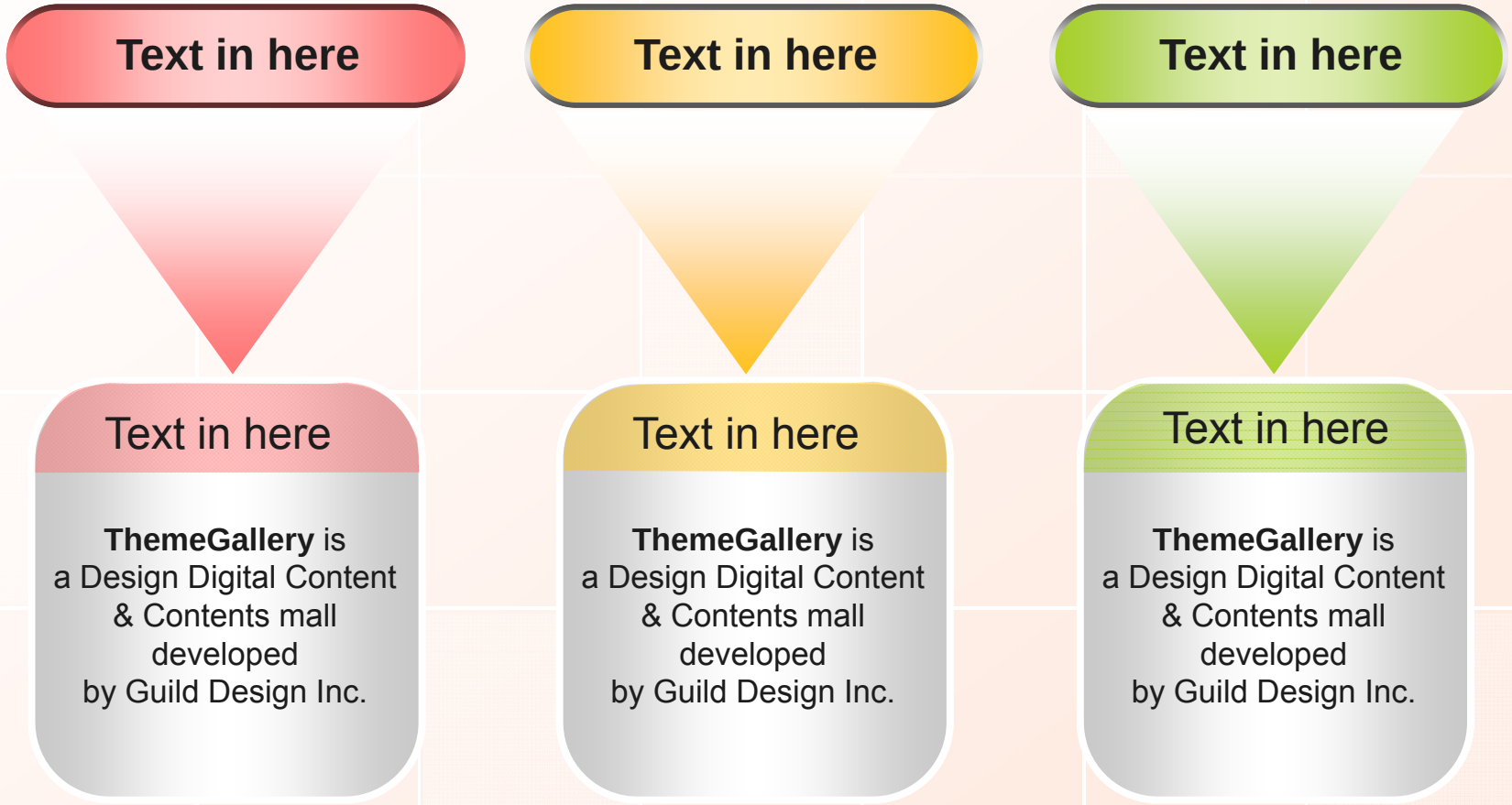

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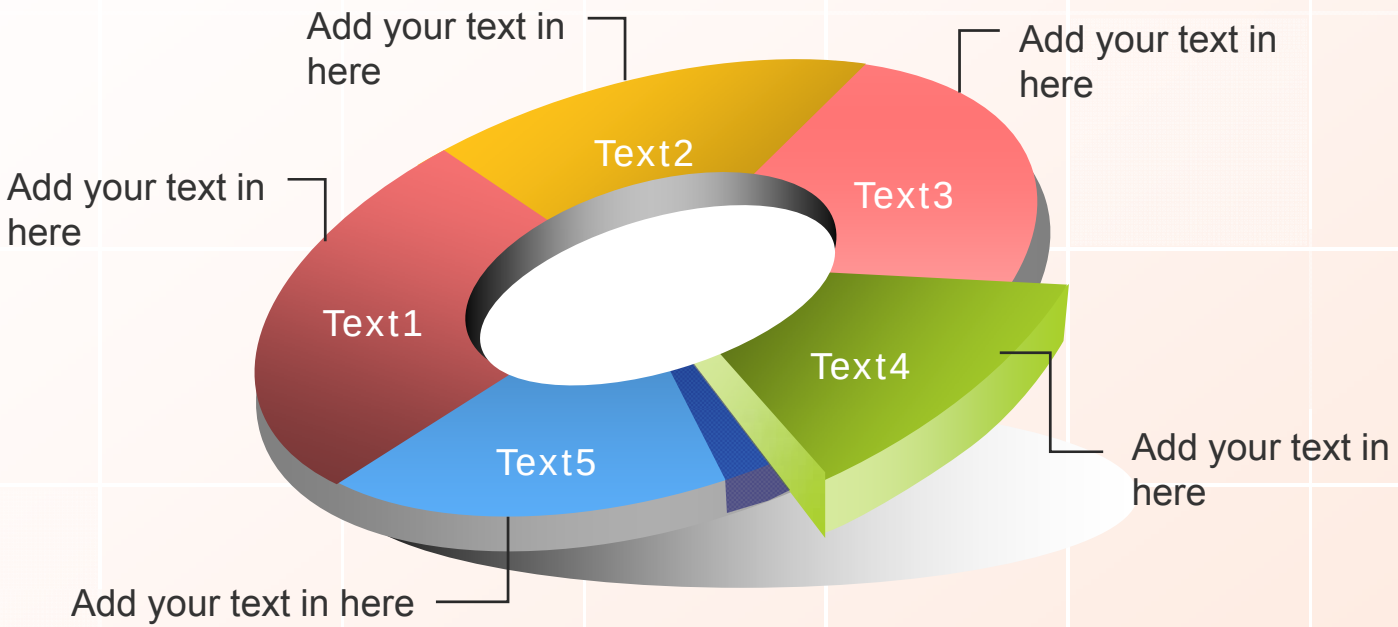

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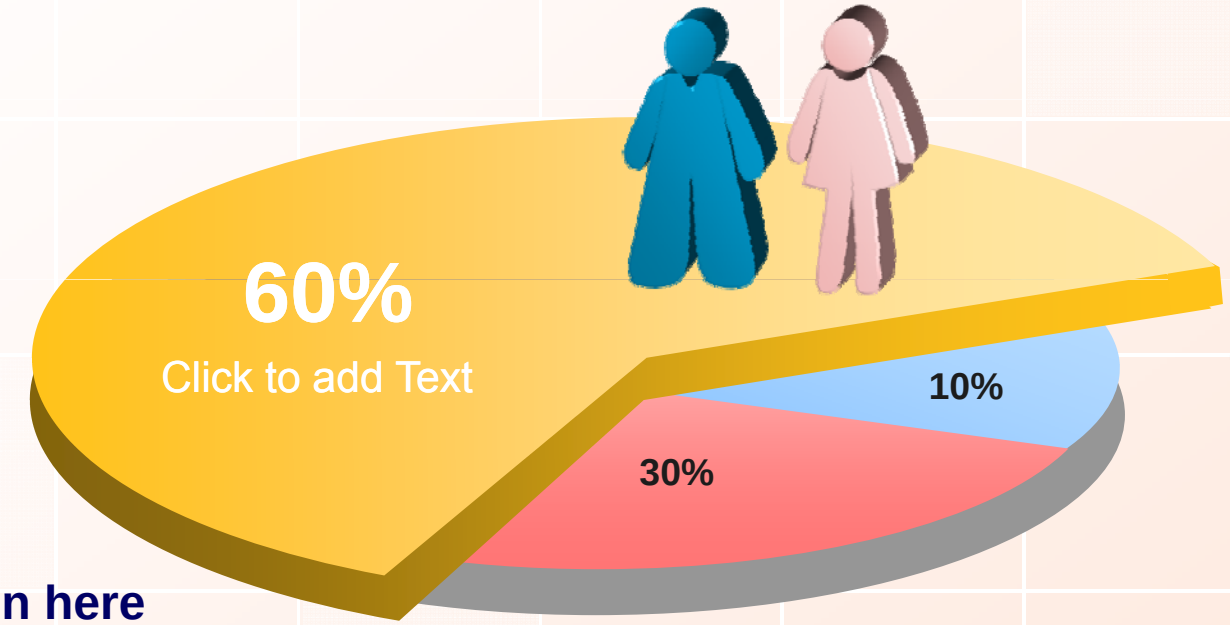

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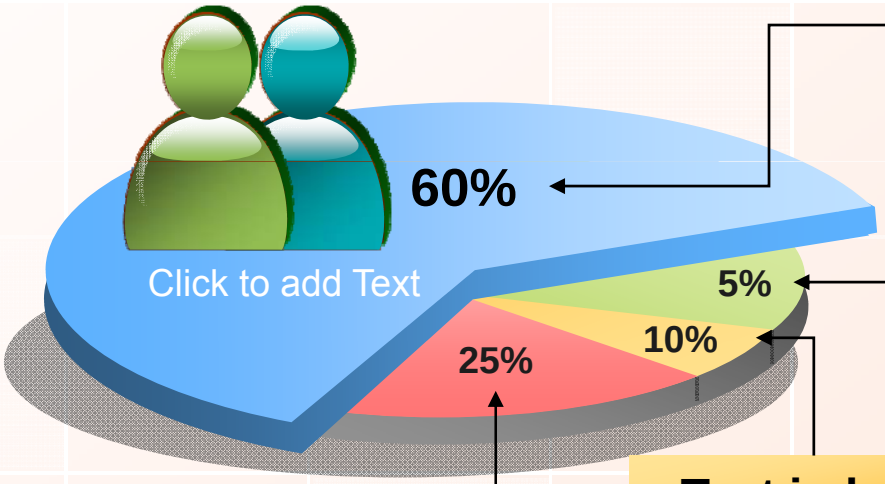

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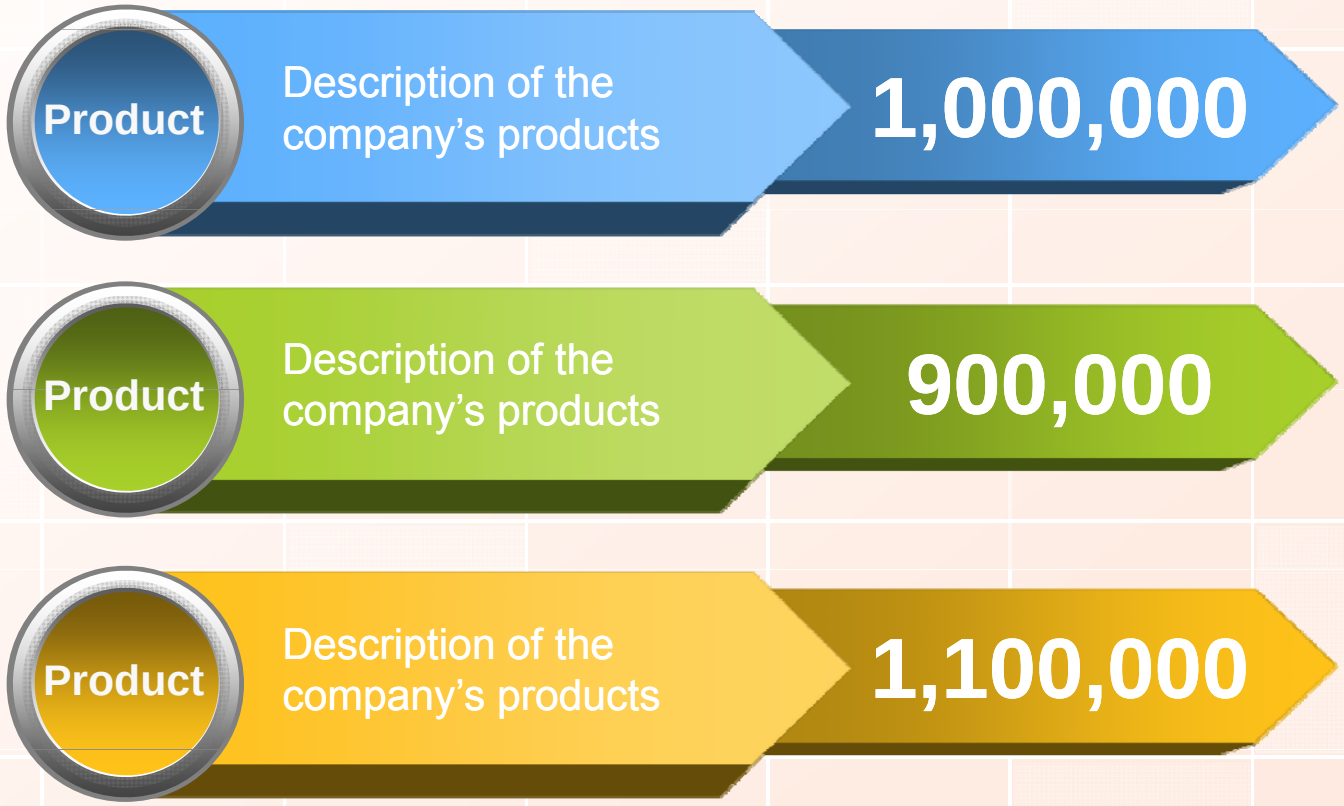

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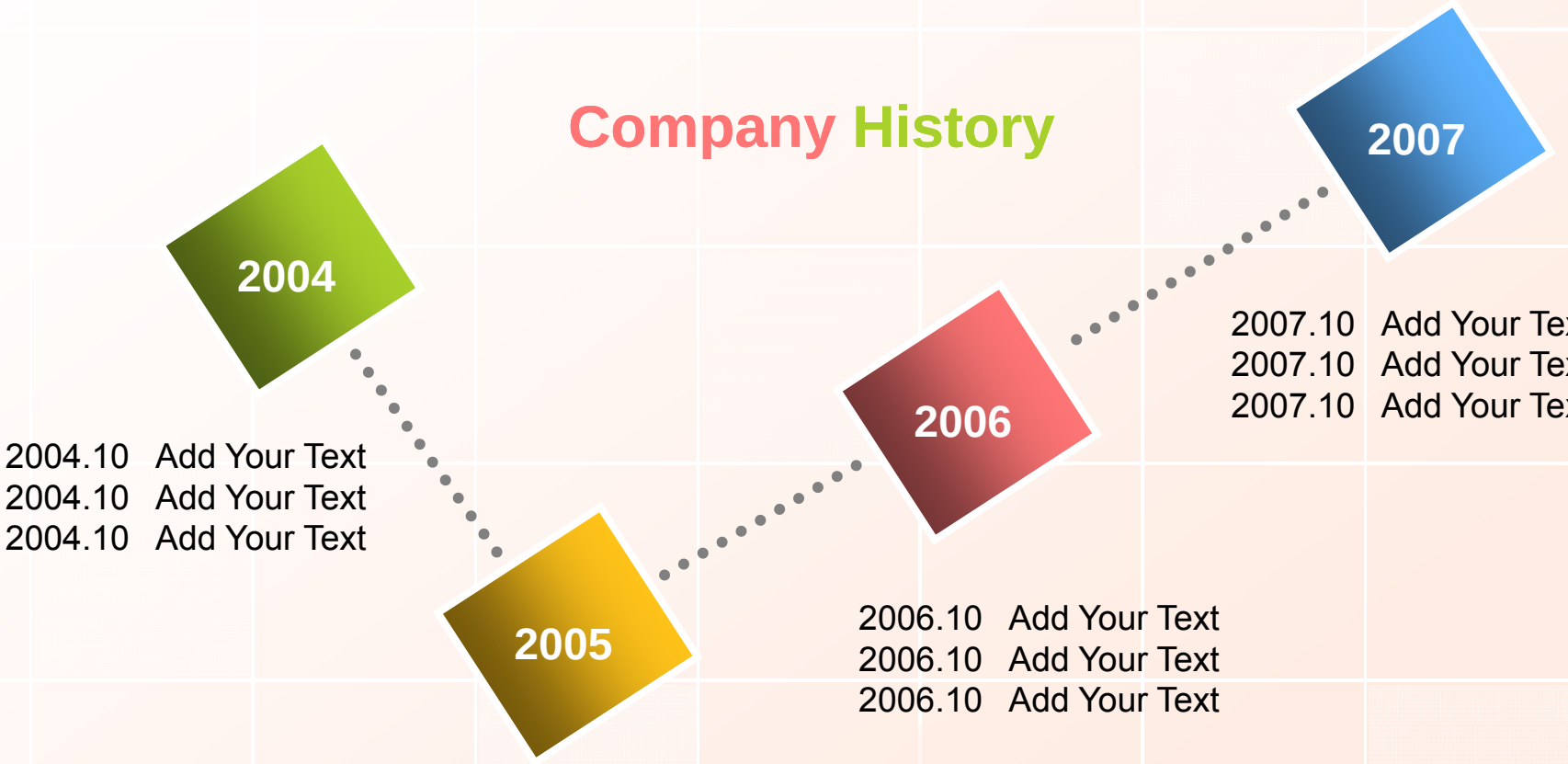

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