

MRI-independent amyloid PET quantification in Down Syndrome: impact of preprocessing pipeline, target, and reference region selection

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Introduction

β-Amyloid (Aβ) accumulation is one of the main hallmarks of Alzheimer's disease (AD) and can be quantified *in vivo* using amyloid PET imaging [1–3]. Individuals with Down syndrome (DS) represent a genetic form of AD: due to triplication of the *APP* gene, they exhibit early amyloid deposition decades before symptom onset [4]. Standard quantification frameworks, such as the Centiloid (CL) scale, typically require high-quality T1-weighted MRI for accurate processing. However, MRI is frequently unavailable or of suboptimal quality in the DS population. Moreover, the distinctive neuroanatomy associated with DS may challenge conventional image processing pipelines [5]. Together, these limitations underscore the need for robust, MRI-independent approaches to amyloid PET quantification in this population.

Objectives

1

Evaluate MRI-independent methods.

2

Assess the **impact of target and reference region** selection on SUVR values.

3

Evaluate the **impact of** using a **DS-specific** or a **standard normalization template**.

Methods

Method

rPOP

AMYQ

SUVR
ComBat harmonization

Population based

DS-specific

General Population

DS-specific

General Population

General population

Target region

Cortex

Cortex

X

X

Cortex

Putamen

Reference region

Whole Cerebellum

Whole Cerebellum

X

X

Whole Cerebellum

Gray Matter Cerebellum

Inferior cerebellum

White matter cerebellum

Eroded white matter

Pons

Table of Demographics

We included a total of 182 from the Down Alzheimer Barcelona Neuroimaging Initiative (DABNI).

	aDS (n=116)	pDS (n=27)	dDS (n=33)	uDS (n=6)	p-value
Tracer no. (%)					0.265
FLUT	98 (84.48%)	19 (70.37%)	29 (87.88%)	5 (83.33%)	
FBP	18 (15.52%)	8 (29.63%)	4 (12.12%)	1 (16.67%)	
Age , median [IQR]	41.67 [34.10; 47.77]	51.67 [48.94; 55.52]	53.20 [49.59; 56.10]	43.51 [39.94; 50.38]	< 0.001
Sex no. (%)					0.875
Female	42 (36.21%)	11 (40.74%)	13 (39.39%)	3 (50.00%)	
Visual Read no. (%)					< 0.001
Positive	35 (30.43%)	24 (92.31%)	33 (100.00%)	2 (33.33%)	
MRI available no. (%)	84 (72.41%)	19 (70.37%)	27 (81.82%)	2 (33.33%)	

