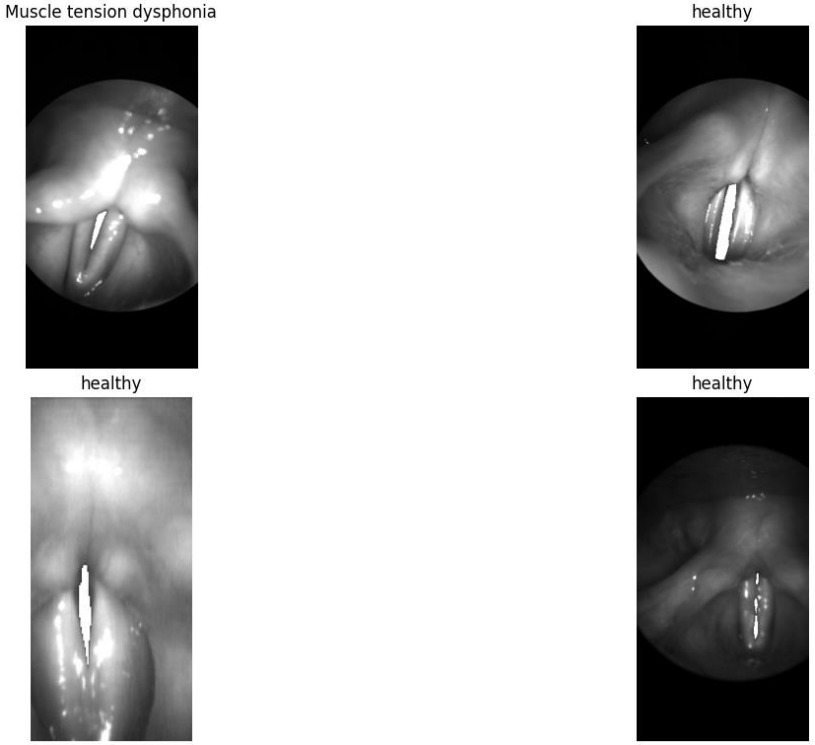
Task 1:

```python
# Define the dataset path
BAGLS_PATH = "Mini_BAGLS_dataset"

# List all files in the dataset directory
files = os.listdir(BAGLS_PATH)

# Filter image files (excluding masks)
image_files = [f for f in files if ".png" in f and not "_seg.png" in f]

# Randomly select 4 image files
selected_images = np.random.choice(image_files, 4, replace=False)

# Initialize lists for corresponding metadata and masks
meta_files = []
mask_files = []
subject_status = []

for image_file in selected_images:
    # get image name(without extension)
    # os.path.splitext(image_file)
    # Output: ("image", ".png")
    base_name = os.path.splitext(image_file)[0]

    # Find corresponding metadata and mask files
    meta_file = f"{base_name}.meta"
    mask_file = f"{base_name}_seg.png"

    # Append to the corresponding file
    if meta_file in files:
        meta_files.append(meta_file)
    else:
        meta_files.append(None)

    if mask_file in files:
        mask_files.append(mask_file)
    else:
        mask_files.append(None)

    # Extract the "Subject disorder status" from the meta file
    if meta_file in files:
        with open(os.path.join(BAGLS_PATH, meta_file), "r") as f:
            metadata = json.load(f)
            subject_status.append(metadata.get("Subject disorder status", "Unknown"))
    else:
        subject_status.append("Unknown")
```

Task 2:



Task 3:

Task 4:

The Luminosity method is preferred for RGB to grayscale conversion as it considers how the human eye perceives different colors, resulting in a more natural grayscale image with enhanced detail and contrast.

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