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%% motiscan_opioid_2level_gripAccu

%% 1. Analysis of major measurements

% define test from dataset
taskname = 'gripAccu';

%% parameters
% define metrics
varname = 'effortDuration';
% ftransform = @ (x) normalize(x,'zscore');
ftransform = @identity;
fname = @nanmean;
varlegend = 'force duration, drug-placebo (sec)';

% define statistical procedure
statisticalTest = {'opioid_contrast'};

% display options
% - plot type
plotType = {'jitter','boxplot'};

%% aggregate data
% - prepare data
nbin = [ ntrt , nsub ];
Y = nan(nbin); % conditional means by treatment
Y2 = nan(nbin); % mean difference to placebo
S = nan(nbin);
% - condition data
for isub = 1:nsub % subject loop
    % select
    tab = data{isub}.(taskname).table;
    selection = (tab.task==taskname) ;
    tab = tab(selection,:);
    % variables
    y = tab.(varname);
    y = ftransform(y);
    trt = tab.treatment;
    trt = removecats(trt,'0');
    trt = reordercats(trt,treatmentList);
    session = tab.sessionNumber;

    % stats
    [~,subtrt] = ismember(unique(trt),treatmentList);
    ysub = splitapply(fname,y,double(trt));
    sess = splitapply(fname,session,double(trt));
    % store
    Y(subtrt,isub) = ysub;
    S(subtrt,isub) = sess;
end
% - concatenate data
Y2 = Y-Y(2,:); % normalize by the subject mean under placebo
% Y2 = Y - nanmean(Y,1) + nanmean(nanmean(Y)); % normalize by the subject mean
Y = reshape(Y,nsub*ntrt,1);
Y2 = reshape(Y2,nsub*ntrt,1);
T = repmat(nominal(treatmentList'),nsub,1);
T = reordercats(T,treatmentList);
S = reshape(S,nsub*ntrt,1);
SUB = repmat([1:nsub],ntrt,1);

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SUB = reshape(SUB, nsub*ntrt, 1);
0 = ones(nsub*ntrt, 1);

%% 2level statistics
% construct linear model
predictor = [ (T=='naloxone') , (T=='placebo') , (T=='morphine') , S, 0 ];
y = Y2;
formula = [varname ' ~ -1 + placebo + naloxone + morphine + session '];
stat = fitglm(predictor, y, ...
              formula, 'VarNames', {'naloxone', 'placebo', 'morphine', 'session', 'order', varname});
coef = stat.Coefficients;
disp(coef);

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	Estimate	SE	tStat	pValue
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naloxone	-0.33376	0.40571	-0.82267	0.41357
placebo	-0.22906	0.38373	-0.59693	0.55254
morphine	0.071425	0.39464	0.18099	0.85692
session	0.11951	0.1613	0.74092	0.46129

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% statistical inference
p = nan(1, numel(statisticalTest));
score = nan(1, numel(statisticalTest));
contrast = [-1 0 1];
for i = 1:numel(statisticalTest)
    try
        contrast = [contrast , zeros(size(contrast,1), ncofactor) ];
        [p(i), score(i), d] = coefTest(stat, contrast)
    end
end

%% display
fig = figure;
clear g;
alpha=0.7;
g(1,1) = gramm('x', T, 'y', Y, 'color', T, 'subset', (T=='placebo'));
g(1,1).set_color_options('map', vertcat(col{[2]}), 'lightness', 100);
g(1,1).set_order_options('x', treatmentList, 'color', treatmentList);
g(1,1).geom_jitter('height', 0.01);
g(1,1).stat_boxplot('width', 0.9);
g(1,1).set_names('x', '', 'y', 'force duration (sec)', 'color', 'treatment');
g(1,1).axe_property('YLim', [min(Y) max(Y)] + [-0.2 0.2]*mean(Y));
g(1,1).axe_property('XLim', [-2 4]);

g(1,2) = gramm('x', T, 'y', Y2, 'color', T, 'subset', (T~='placebo'));
g(1,2).set_color_options('map', vertcat(col{[1 3]}), 'lightness', 100);
g(1,2).set_order_options('x', treatmentList([1 3]), 'color', treatmentList([1 3]));
g(1,2).geom_jitter('height', 0.01);
g(1,2).stat_boxplot('width', 0.9);
g(1,2).set_names('x', '', 'y', 'force duration, drug-placebo (sec)', 'color', 'treatment');
g(1,2).axe_property('YLim', [min(Y2) max(Y2)] + [-0.2 0.2]*mean(Y2));
g(1,2).axe_property('XLim', [0 3]);

g.draw;

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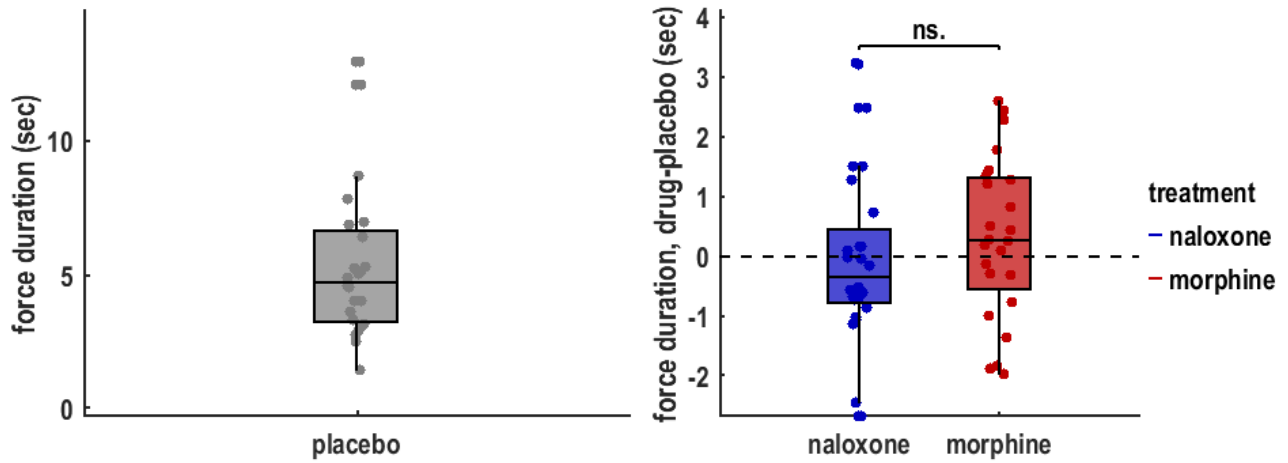
ordering given as values  
 ordering given as values

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axes(g(1,2).facet_axes_handles);
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for i = 1:numel(statisticalTest)
    xloc = [1 2];
    pstar = p(i); if pstar>0.10; pstar=NaN; end
    sigstar({xloc},pstar);
end
set_all_properties('FontName','Arial Narrow','FontWeight','bold','FontSize',16,...
    'LineWidth',1.5,'FaceAlpha',alpha);

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l = plot(g(1,2).facet_axes_handles.XLim,[0 0], '--k');
fig.Position = [ 100 100 900 400];

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