

6. Temporary modulation for exercise and lighter (in-)activity V 3.6

Please note that with autoISF you are in an early-dev. environment, where the user interface is **not optimized for safety** of users who stray away from intended ways to use. Good safety features exist, but these are only as good as the development-oriented user understands and implements them.

This is not a medical product, refer to disclaimer in [section 0](#)



6.1 Dynamic iobTH and sensitivity ratio

6.1.1 Manual (direct) iobTH modulation

6.1.2 Automations for iobTH modulation

6.1.3 Dynamic iobTH

6.2 Temp. % profile switch

6.3 DIY cockpit based on User action Automations

6.4 Improved FCL cockpit

6.4.1 Manual (direct) iobTH modulation

6.4.2 pre-sets for 4 kinds of exercise

6.4.3 optional meal pre-sets

6.4.4 optional hypo management pre-sets

6.5 Mastering the exercise after meal challenge

6.5.1 Manual mode

6.5.2 DIY cockpit button for User action Automation

6.5.3 Laissez-faire mode

6.5.4 Using pre-sets in improved FCL cockpit

6.6 Activity monitor based on step-counter

[Available related case studies:](#)

Case study 6.2: Biking day with hi carb lunch;
..... DIY cockpit

Skip what is in green writing:

= Drafted fragments or not implemented ideas.

Preliminary remarks

This section is **no easy read** because it attempts to describe *all options* to deal with *various types* of exercise.

- Fortunately, you might need *none* of them,
- you can set *any* of them up at your leisure, later, one at a time, for any of your occasional or regular exercise events,
- then pick one or two of the described options, how to go about it.

- As long you were not able yet to define better ways, you should always be able to manage bg dropping during sports with **extra snacks** (keep those at hand).

Staying in contact with the related discord/github community should help greatly to find suitable ways to manage *your* type(s) of exercise.

- Please report *your* experience by supplying a case study.

Looking at case studies that relate to *your* kinds of exercise might be easier to digest than working your way through *all the options laid out* in this section.

For detail insights into how to manage **various kinds of exercise**, listen-in this reference by looping pioneer and sportswoman Dana Lewis: https://bit.ly/DC1_631 (starts around minute 05:30). Same is available through bit.ly/DiabetesCxnsAndroid or bit.ly/DiabetesCxnsApple

6.1 Dynamic iobTH and sensitivity ratio in „exercise mode“

iobTH is a iob threshold you can set, above which AAPS will no longer deliver additional SMBs.

(This overrides the SMB management via even/odd bg target differentiation).

(Regarding by how much “*the last SMB*” may shoot over iobTH, see [section 2.4](#)).

For exercise, we like to limit how high iob can go, therefore automatic “dynamic” reduction of your set iobTH (= iobMAX x iobTH%) is a benefit, notably as you can individually tune it.

In autoISF 3.0 and later, a setting for iobTH is made in AAPS preferences, defined there as fraction (e.g. 0.6) of your set maxIOB:

/OpenAPS_SMB/autoISF_settings/Full_Loop_settings: iob_threshold_percent,

=> default iobTH = iobMAX x **iob_threshold_percent**

So, while iobTH could also be modulated via iobMAX, we mostly adapt the iob_threshold_percent to do that.

64 In the following, 3 principal avenues to temporary adjusting iobTH to your exercise
65 requirements are described: **Manual** intervention ([6.1.1](#)), making use of individually defined
66 Automations ([6.1.2](#)), and relying on the automatic dynamic adjustments coming with autoISF
67 ([6.1.3](#)) .

68 The author experimented with all of them, but rarely needs manual intervention
69 because the **automatic “dynamic”** adjustments work pretty well, after some
70 individual tuning (see e.g. case study 6.2).

71 In any case it is good to educate yourself about manual tweaking options, should the
72 need arise.

73

74 6.1.1 Manual (direct) iobTH modulation

75

76 „Manual“ routes to directly change iobTH would be

- 77 • changing the setting for the new parameter „iob_threshold_percent „
- 78 • or changing the setting for iobMAX

79 in /Preferences.

80 This is not a preferred route for temporary adjustment, because it is not easy accessible with
81 just a button stroke, and it would not automatically revert to your prior setting, after use.

82 A future improved FCL cockpit (-> [section 5.3](#)) might give direct access to

- 83 • **override iobTH temporarily, at any point of time.**

84 A bridging solution that can achieve nearly the same is: to construct your own “DIY
85 cockpit” button to change iobTH% from the AAPS main screen, see next section.

86

87 6.1.2 Automations for temporary iobTH modulation

88

89 You can define Automations that set a different iobTH% **under pre-defined conditions**

90 In a variation of this idea (if your Automation has the User Action box ticked), you get
91 a grey button into your AAPS home screen, from which you can activate that changed
92 iobTH manually (“DIY cockpit”, as was already presented in [section 5.2.2.3](#))..

93 Note that this is the iobTH you tell the loop to use **in place of** the previously set iobTH:

94 ● it will still be modulated further if %profile and TT are set (see below)

95 ● it will overwrite the iobTH% you had set in /preferences!

96

97 **Caution:** A different iobTH% or bgAccel_ISF_weight can *not* be set *temporarily* in

98 Automations (i.e. a *duration cannot be attached*). You **must** define a suitable **additional**

99 **Automation that** must be active in tandem, that **restores the prior set iobTH%** or bgAccel-

100 ISF_weight **again**. Else, once your Automation sets in, it will *forever* shift this important

101 parameter setting!

102 If for instance you have several Automations that, in combination with a set elevated TT also

103 set a lower iobTH: Don't be fooled, the duration only applies to the TT. You need an extra

104 Automation for all of them.

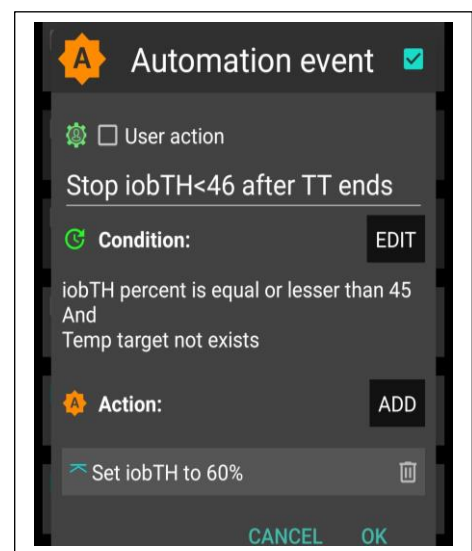
105 Example: My Automation that restores my prior set profile

106 iobTH%:

107 I picked out the *highest* of the *lowered* iobTH values that
108 *other* Automations can set (45 percent was the highest “of
109 the low ones” in my case), and then I can automatically
110 restore to my *prior* 60% via this one:

110

111 **Caution:** Watch out for another potential stumbling block,
112 because many Automations only work under the condition
113 that no TT is already running.



113 As temp. changing iobTH is quite tricky to automate, it is the author's preferred route to only
114 *indirectly* modify it – see next section.

115

116 6.1.3 Dynamic iobTH: iobTH modulation via setting a temp. glucose target (TT)

117

118 In AAPS/Preferences, set “**High TT raises sensitivity** = TRUE”. Then, setting an **elevated**
119 temporary glucose target (TT), decreases iobTH by the same factor as it increases sensitivity
120 (as it “softens” ISF). Both measures decrease insulin the loop can give.

121 Likewise, In AAPS/Preferences, set “**Low TT lowers sensitivity** = TRUE”. Then, setting a
122 **low** temporary glucose target (e.g. a EatingSoonTT of 74 mg/dl), elevates iobTH by the
123 same factor as it also sharpens (lowers) the ISF. The loop can give more insulin.

124 6.1.3.1 How does automatic sensitivity and iobTH adaptation work in the exercise mode?

125 **When. additionally. the exercise button is ON (lit yellow), iobTH gets reduced**
126 **particularly strong, and ISF is particularly weakened (as desired for exercise).** That
127 effect is the stronger (ISF gets the weaker, iobTH the lower), the lower you set the half-
128 **basal exercise target** for your exercise mode in AAPS/preferences/OpenAPS SMB:

129 The following table shows, for a profile target of 100 mg/dl, how the set ...

- 130 • @ half_basal_exercise_target you set in AAPS/preferences/OpenAPS SMB...
- 131 Choose a low number if you later want a high dynamic range of sensitivity modulation
- 132 Lower half-basal exercise target = lesser insulin delivered

- 133 • ... and @ your current exercise TT that you set on the day you do the respective
134 exercise, with an eye on how you wish sensitivity auto-adjusted...

135 Higher TT = lesser insulin delivered

136 ... determine the effective sensitivity ratio.

Half basal ex.target	180	150	120
TT	sens.ratio	sens.ratio	sens.ratio
100 = profile target	1	1	1
120	0,8	0,71	0,5
140	0,67	0,56	0,33
160	0,57	0,45	0,25
180	0,50	0,38	0,20

137 The exact calculation for any combination of profile target, set TT, and half-
138 basal_exercise_target is given in [section 3.3](#)

139 Note that:

- 140 • **temp. basal = profile basal * sens.ratio**

141 *Example: At a half-basal_exercise_target of 120, setting a TT of 120 gives only half (0.5) of*
142 *profile basal (hence the name of the parameter)*

143

- $\text{temp.ISF} = \text{profile ISF} / \text{sens.ratio}$
- $\text{temp.iobTH} = \text{set iobTH} * \text{sens.ratio}$

Whereas in “vanilla” AAPS the sens ratio is simply coming from you (manually) or Autosens (automatically) setting a temporary profile sensitivity other than 100% (and in the special case of dynamicISF with additional effects on ISF), here in autoISF we have strong, non-linear, and user scaleable effects on the sens.ratio.

6.1.3.2 How you recognize the real-time iobTH, and “aggressiveness” status of your FCL loop in general

Rather than bothering with the math, you can just look into your **SMB tab** where your selected temporary settings put your iobTH , and the modified ISF (called **sens**):

The valid “effective iobTH” can also be seen in the SMB tab, see example (for a **TT=144** and exercise button clicked);

Same, with (via top left button in AAPS home screen) **additionally 70% profile** applied:

```

COMBOV2  SMB  AUTO  NSI  :
Last run : 3/29/24 20:55

Result

Script debug : d:
  Activity monitor disabled:
  tempTarget
  Sensitivity ratio set to 0.53
  based on temp target of 144
  Adjusting basal from 0.75 to
  0.398;
  ISF from 39 to 73.6
  CR: 7

  -----
  start autoISF 3.0.1

  User setting iobTH=60%
  modulated to 32% or 3.18U
  due to profile % and/or
  exercise/activity mode
  SMB enabled; current target
  144 is even number
  Loop allows medium power
  acce_ISF adaptation is 0.71
  bg_ISF adaptation is 0.65
  final ISF factor is 0.34
  including exercise mode
  impact

  -----
  end autoISF

  currenttemp: 0 lastTempAge: 0
  m tempModulus: 21 m
  profile.sens: 39 sens: 113.2
  CR: 16.17
  
```

```

COMBOV2  SMB  AUTO  NSI  :
Last run : 3/29/24 21:01

Result

Script debug : d:
  Activity monitor disabled:
  tempTarget
  Sensitivity ratio set to 0.53
  based on temp target of 144
  Adjusting basal from 0.52 to
  0.276;
  ISF from 57 to 107.8
  CR: 10.714285714285714

  -----
  start autoISF 3.0.1

  User setting iobTH=60%
  modulated to 22% or 2.23U
  due to profile % and/or
  exercise/activity mode
  SMB enabled; current target
  144 is even number
  Loop allows medium power
  Parabolic fit extrapolates a
  maximum of 107 in about 4
  minutes
  acce_ISF adaptation is 0.95
  bg_ISF adaptation is 0.65
  final ISF factor is 0.34
  including exercise mode
  impact

  -----
  end autoISF
  
```

profile.sens 39 sens: 162 = 39 / (0.34 * 70%)

172 These examples show that, **by just setting an exercise TT and a typical exercise**
173 **profile%** (two super easy “interventions” via the top buttons on our AAPS main screen,
174 turning yellow in response as an easy “reminder” we are in a special mode), **the iobTH will**
175 **be automatically very sharply reduced** (in our example, to about half just by the TT; and
176 further to about 1/3, by the % setting)

177 From the figures given (left side), the user’s iobTH calculates to 6.0 U (= (60%/32%)*3,18U)
178 which is 60% of iobMAX of 10.0 U. So, normally, autoISF FCL could give SMBs up to
179 anywhere between 6.0 U and 7.2 U (=6.0 +20%; see [section 2.4](#) at step 2.4: at bg>100, iob
180 can run max. 20% over with “last” SMB). For doing exercise, this window shrinks now to 3.18
181 – 3.82 U (left) or, even to 2.23 – 2.77 U (right).

182 In conclusion, these easy-to-make settings (TT, %profile) automatically provide the same
183 thing like would have been done in Hybrid Closed Loop, where a meal bolus of about 7 U
184 would get cut down to 4 U or even to 3 U, depending on type of exercise.

185 If you concurrently use QPython 3L and the emulator on your Android phone (see [section 11](#))
186 you need not look into the SMB tab, but could see more details (~ for the last hour, plus all
187 contributing ...ISF_categories from autoISF), in tabular form, on your phone.

188 For i-Phone autoISF users, double clicking on “Statistics” also provides similar information
189 (see [section 11.3](#)).

190 6.1.3.3 Customization and-tuning

191 Try to determine good settings for the kinds of exercise that you engage in:

192 Set your **half-basal exercise target** in /preferences that suits all of them...

193 • ... in tandem with reasonable TTs that you like to use later, for each of your
194 intended specific exercises

195 • Iterate through this a couple of times (whenever you happen to do *that*
196 exercise).

197 ⇨ **Remember** (“code” for yourself), **which TT stands for which exercise type, so**
198 **that just by setting *that* TT everything (ISF, iobTH) *automatically* will provide**
199 **the lower loop aggressiveness that you need for that specific type of**
200 **exercise.**

201

202 When setting a TT please watch out for unintended implications and side-effects:

203 (1) Setting a TT often **shuts out other** Automations.

204 Therefore, choose the **duration** wisely (and also the **sequence**, in which all your
205 Automations are listed).

206 (2) You always must consciously decide whether you set an **even or an odd** numbered bg
207 **target** (TT or profile target). (This is assuming you use, as you should, the even/odd bg
208 target differentiation for SMB on/off).

209 • Pick **odd**, if you do not want SMBs during exercise. (Despite your softened ISF, and
210 lowered iobTH, SMBs still might „attack“ a sports snack too strongly).

211 ○ However, odd cannot be set too early, when your meal digestion still
212 requires SMBs.

213 ○ Likewise, you might want the option for a few automatically delivered SMBs
214 against unforeseen spikes (e.g. from excitement) also later.

215 In that case, an **Automation** might **sneak in a desired SMB** or two via
216 switching from odd to even, just for a couple of minutes, and under a well
217 thought-out set of conditions (that you must find in **your** data patterns,
218 when you do that kind of exercise that you try to find good settings for),

219 However, you are probably out of luck because an already set odd (or
220 any) TT would preclude such Automation from kicking in. Then you
221 need to **develop additional** ideas, another detour, like to first define an
222 **Automation that briefly shuts your odd TT down**.

223 ○ So, defining everything so you really can be happy with oddTT being
224 your primary way is a quite tricky project you should not under-
225 estimate.

226 • Working with an **even** TT can be preferable, notably of course if your exercise is one that
227 can get you totally excited, with glucose spikes.

228 ○ While this mode generally does allow SMBs, the loop softens the ISF (by the
229 sens.factor like in the table given above), and will temp. shut SMBs down, when
230 **iobTH** (which also got lowered by the sens. factor) is exceeded.

231 Whether odd or even TT is better depends on the kinds of exercise you are doing, and
232 probably depends on the protein and fat load of your meal and snacks, as well.

233

234 (3) **Timing** can be **critical** as to when you do your exercise announcement, especially
235 relative to a preceding hi-carb meal. Then you want the reduced iobTH in place latest after
236 you received the first SMB. See [section 6.4](#) and [case study 6.2](#)

237

238 (4) Once you are familiar with the **dynamic range of your iobTH**,

- 239 • after you made your settings, notably set your half-basal exercise target
- 240 • knowing the range of TTs and %profile adaptations that you intend to use
- 241 before/during/after your types of exercise

242 please confirm or re-consider *your iobTH_percent setting in /Preferences*, [section 2.4](#).

243

244 (5) You always can **look the effective iobTH up in the SMB tab** (see screenshots given 3
245 pages earlier).

246 In future releases you might see the valid iobTH that your loop is working with also in
247 your AAPS home screen, next to the current iob status.

248

249 6.1.4 Tweaking iobTH

250 You can use any of the above discussed methods, or also the one that now follows in [section](#)
251 [6.2](#), to *further tweak* iobTH temporarily, should you see a need.

252

253 Also outside of exercise, setting an **even elevated TT plus** pressing the **exercise button**
254 gives easy access to **significantly reduce aggressiveness of your autoISF loop** via a
255 resulting lowered iobTH and, concurrently, elevated effective ISF.

256 This could be used for instance for 45-60 minutes **at low/medium carb snacks**, as an
257 alternative to shutting SMBs **entirely** off via an **odd** TT.

258 When *exercise follows a meal*, it might be smart to use the just discussed tweaking methods
259 right after you felt the sting from the first big Lyumjev SMB.

260 However, we will look at smarter and safer ways for this “exercise after meal” scenario in
261 [section 6.5](#) and in [case study 6.2](#)

262

263 6.2 Temporary % profile switch

264

265 A complementary measure you can take from the AAPS home screen is to set a **reduced**
266 **temp.% profile** sensitivity.

267 This setting would **multiply** with the results in above table and further reduce basal and
268 **iobTH**_(whenever exercise button AND profile button both are yellow).

269 An example was already given with the 2nd screenshot, 3 pages earlier

270

271 Note that temp. reduction of basal will proportionally also **reduce the max. allowed size of**
272 **SMBs** (which is two hours worth of basal x SMB_range_extention, see [section 2.1](#))

273

274 The **time windows** for doing a profile switch *can differ* from the time window (duration) of
275 your TT-related exercise settings. **Using all available tools then allows a nearly surgical**
276 **approach to what you want to achieve for and during your favorite exercise(s).**

- 277 • Often the %profile modulation is used for several hours if not days to accommodate “long
278 waved” sensitivity swings (See e.g. in [case study 6.2](#)).
- 279 • Instead, or even additionally, the percentage might be modified for just a couple of
280 minutes, or for one special snack or meal duration, to “nudge” the proportionally
281 modulated aggressiveness of the FCL (see [section 5.2.3](#)).

282

283 You can prepare yourself for anything you see coming up, or potentially coming up, in your
284 daily life, so, from the comfort of your cockpit ([section 6.3](#); [section 6.5.2](#)) you get ready for it
285 within just a second or two, doing a few „clicks“.

286

287 6.3 Managing exercise via Cockpit inputs

288

289 You may want to skip reading the **green texts** which are about suggested further features in
290 future software updates

291

292 6.3.1 Basic Settings for Exercise

293

294 Coming from FCL with no TT set (both top fields, TT and exercise, are grey), you best
295 prepare for an intended exercise by **pressing the TT field** of your AAPS main screen (your
296 looping cockpit; presented in [section 5.2](#)).

297 There, you can **freely select** TT and duration.

298 **Alternatively, you can press on one of 4 offered exercise presets.** (Note: This, and many
299 other – in this green color - described cockpit features are yet to be developed)

300

301 When you do either one, the exercise button in the top middle of your AAPS main screen
302 should turn yellow (or just press on the exercise button, when a TT is set.)

303

304 6.3.2 „Dynamic“ exercise mode off = traditional AAPS exercise mode (YGY)

305

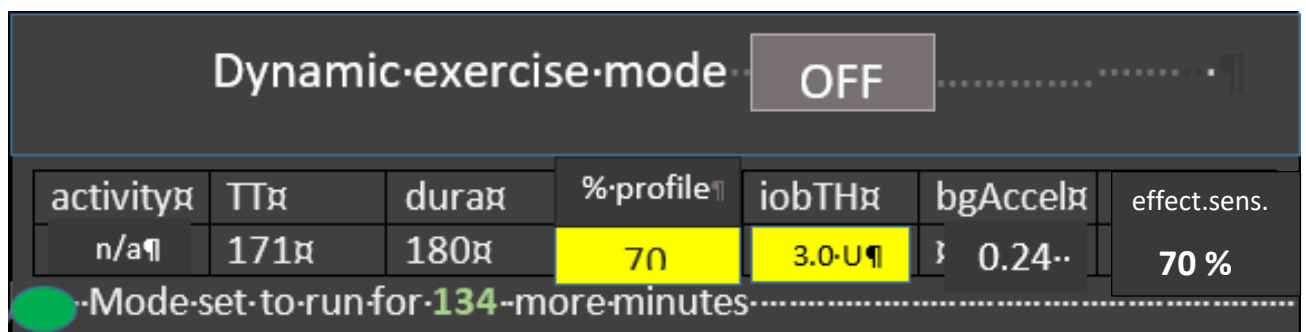
306 When the dynamic exercise mode is off, you still have the instruments for *exercise*
307 *management just as you always had it in the past* = a combination of manually softened
308 aggressiveness via setting a temp. %profile change, and orienting corrections towards an
309 elevated TT.

310

311 By selecting an odd numbered TT you now have the *additional option* to shut SMBs
312 temporarily off, too.

313 **Continue with** section 6.5 – The following **green texts** (and embedded screenshots)
314 **describe currently not available features that were suggested for further development**

315 **If improved cockpit is launched, the top part of the dialogue box looks about like this when**
316 **the exercise field is grey:**



317

318 % profile can be changed:

- 319 • either here => neighboring %profile button turns yellow too (with the % info on it); or
- 320 • under the %profile button; or
- 321 • it had already been changed using AAPS / Action / Profile switch

322 In all 3 cases, you see the number < 100 or >100 in the middle of above table, on a yellow
323 colored field, too.

324 In this “YGY” mode, the % temp. set profile is the applied “effective sensitivity” (% ratio)

325

326 TT and duration can be entered or changed (= traditional mode to set exercise targets).

327

328 If there is a desire to try, for the **remaining duration**, a different iobTH or bgAccel_ISF-
329 weight, this can be overridden in the table; field turns yellow, and the algorithm uses temp.
330 iobTH and/or temp bgAccel_ISF_weight as modified in the exercise button (and reports this
331 also in the SMB tab).

332 *In the dialogue box pictured above, 70% profile was set for 3 hours, and the default*
333 *iobTH of 60% * 10 U was cut by 50% down to 3.0 U.*

334 The remaining duration shows below the table (in the example: 134 minutes and counting
335 down).

336

337 The effective iobTH is given in the SMB tab. In later versions, the effective iobTH should
338 show also in the AAPS home screen, next to the actual iob (e.g. „1.2 U < 3.0 U“)

339 TT and % profile will also show on the yellow labels of the neighboring %profile (left top of
340 AAPS home screen) and TT (right side), respectively.

341

342 The middle (exercise) field remains grey because the automatic sensitivity tuning (that would
343 use TT and half-basal exercise target) are off.

344

345

346

347

348

349 6.3.3 Dynamic exercise mode ON (GYG or YYY)

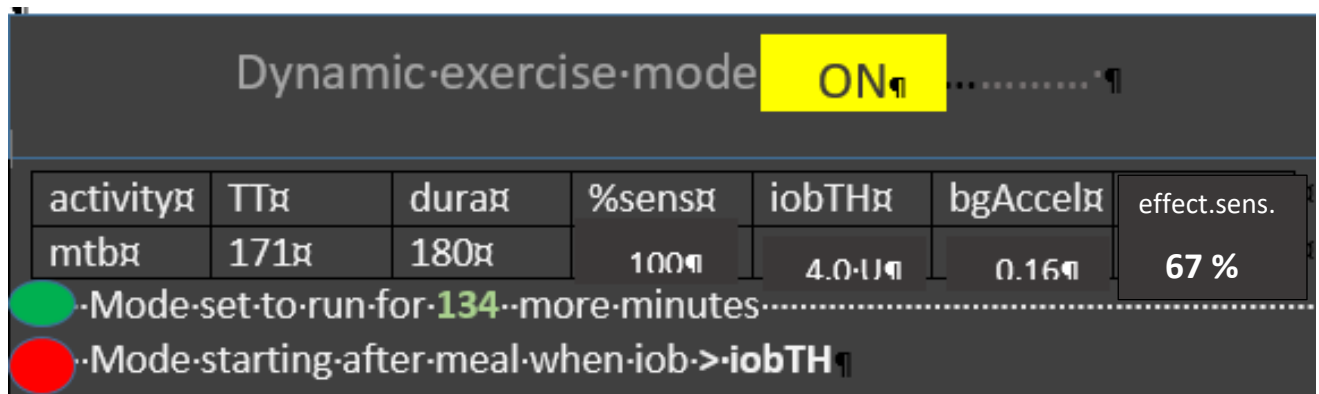
350

351 By pressing the yellow exercise button on the AAPS home screen, *you have the*
352 *option* to switch the **dynamic exercise mode ON**, in which case the middle
353 field/exercise button of your AAPS main screen will go from grey to yellow.

354

355 In a version update you could do your setting for the upcoming exercise under the **dialogue**
356 **box of the TT button**

357 Then, when you look into the exercise button in the middle of your FCL cockpit the dynamic
358 exercise mode will automatically be „ON“, and all entries made:



activity	TT	dur	%sens	iobTH	bgAccel	effect.sens.
mtb	171	180	100	4.0-11	0.16	67 %

● Mode set to run for 134 more minutes

● Mode starting after meal when iob > iobTH

359

360 The data for the kind of exercise (*here mtb; could also be n/a or ?*) are coming from prior
361 selections made in the dialogue box of the neighboring TT field. There, as well as in this
362 window here, the resulting iobTH and bgAccel_ISF_weight are shown. Also the overall
363 aggressiveness (% overall insulin sensitivity factor) is calculated.

364 The **middle field** of the table in this dialogue box, **% profile** either picks up the % set under
365 the %profile button, or an input can be made here, in the exercise button domain, which will:

- 366
- turn the neighboring %profile button on yellow and show that inputted % on it, too
 - be multiplied with the result from the exercise mode settings per se, and change the
- 367
- 368 effective sensitivity %, accordingly.

369 So, if this middle field of above table (dialogue box of exercise button) contains a figure other
370 than 100, the input field becomes yellow, and you are operating with a combination of
371 traditional PLUS new exercise mode (with all three top buttons of your FCL cockpit yellow).

372 This maximally will soften aggressiveness, for which you get an idea by the last calculated
373 figure.

374 The mode is either running already (*for another 134 of the total 180 minute in the picture*) as
375 also the label on the neighboring yellow TT field will show *171 (134, and counting down)*,
376 Or (*see at the red dot in picture above*), it is scheduled to run, after insulination for a started
377 meal surpasses iobTH (*as in table*).

378 Note that, when the TT expires or is changed, your overriding input (if you made any)
379 is automatically erased, forgotten.

380

381 6.3.4 Dynamic exercise mode ON plus %profile change (YYY)

382

383 The **middle field** of the table in the dynamic exercise mode dialogue box (see above), %
384 **profile**“ either picks up the % set under the %profile button, or an input can be made here, in
385 the exercise button domain, which will:

- 386 • turn the neighboring %profile button on yellow and show that inputted % on it, too
- 387 • be multiplied with the result from the exercise mode settings per se, and change
388 the % overall, accordingly.

389 So, if this middle field of above table (dialogue box of exercise button) contains a figure other
390 than 100, input field becomes yellow, and you are operating with a combination of traditional
391 plus new exercise mode (with **all three top buttons** of your FCL cockpit **yellow**). This
392 **maximally will soften aggressiveness**, for which you get an idea by the last calculated
393 figure.

394 Maximal softening happens only **when >100% profile**. A <100% profile is not used for
395 exercise typically, and would counter-act the softening from the elevated TT.

396 It is advisable to find good settings primarily *within* the dynamic exercise mode. Use profile
397 switches only complementary as needed. notably to provide for other, „longer waved“, health
398 or hormonal situations.

399

400 Note that you can make use of the **exercise button** at any time for easy tweaking..

401 • yellow -> off/grey = increase

402 • grey -> on/yellow = decrease (only possible if a TT> 100 mg/dl is set)

403 ..the aggressiveness, without changing (and changing back) settings.

404 6.4 Option to pre-set for 4 kinds of exercise or meals (for 1 button operation)

405

406 You may want to skip the entire section 6.4 because (*green texts*) mostly it is about

407 non-existing further features, suggested for future software updates

408

409 6.4.1 iob_threshold_percent

Skip what is in green writing:

= Drafted fragments or not implemented ideas.

410

411 In AAPS preferences/OpenAPS SMB/autoISF settings / Full Loop Settings, the default

412 iob_threshold_percent used for the normal meal spectrum is defined.

413 In an updated later autoISF version you might be able to differentiate there for up to 4 meal

414 clusters (see next section)

415

416 6.4.2 Pre-settings for (up to) 4 kinds of exercise:

417

418 In AAPS preferences/OpenAPS SMB/autoISF settings / Full Loop Settings: follows next input

419 fields for pre-settings you can define for (up to) 4 kinds of exercise:

420 The following table gives an example of settings you may find well-suited for 4 of your

421 favourite exercises

#1-4	give name (max 3 characters)	duration for TT (min)	TT (AC) (mg/dl)	% profile	iobTH	bgAcce:weight	Approx % ins reduct.
1	wlk	60	111	100			
2	grd	120	131	90			
3	bik	300	151	90			

4	mtb	180	171	70			
---	-----	-----	-----	----	--	--	--

422 Input fields (during tuning phase to determine good settings) are only the columns 2-5.

423 The last 3 columns will be calculated from TT and %profile inputs, using also the half-basal
424 exercise target and the default weight setting. In this setting.

425 The last is only an approximation to get a feel for a reasonable setting of the other
426 parameters.

427 Here in preferences they should never be overridden, but TT or % profile should be adjusted
428 to reach desired result when tuning for FCL.

429 Likewise, you find tables to make pre-settings for meals and for hypo treatments:

430

431 6.4.3 Pre-settings for (up to) 4 kinds of meals:

432

433 In AAPS preferences/OpenAPS SMB/autoISF settings / **Full Loop Settings**: follows next:

434 Input fields for pre-settings you can define for (up to) 4 kinds of meals. For instance:

TT# 1-4	give name (3 letters)	TT (Eating Soon) (mg/dl)e	Duration for TT (min)	iobTH (0---130% and < iobMAX)	bgAcce factor 200...0%	
1	hiC	72	120	110	110	
2	loC	74	180	67	67	
3	piz	76	300	100	100	
4	snk	78	60	100	50	

435

436 Input fields (during tuning phase to determine good settings) are all columns

437 Difference in TT is fairly unimportant (unless you do not give a name and memorize the set
438 TT number instead, for which meal type it codes.

439 Logic why not having a % profile column here: %profile switch should be set extra,
440 potentially for another time period (e.g. „reserved“ for periods of exercise, or for entire
441 days of altered insulin sensitivity, for instance due to illness, fasting, extensive sports
442 week.)

6.4.4 Pre-settings for (up to) 4 kinds of Hypo treatment:

444

445 In AAPS preferences/OpenAPS SMB/autoISF settings / **Full Loop Settings**: follows next:

446 Input fields for pre-settings you can define for (up to) 4 kinds of HYPO treatment. Example:

TT (ES) (mg/dl)	give name (3 letters)	TT (AC) (mg/dl)	Duration for TT (AC) (min)	bgTH (mg/dl)	
1	Hy1	131	55	none	
2	Hy2	131	55	200	

447

448 Input fields (during tuning phase to determine good settings) are all columns, 2-5.

449 Choosing an odd-numbered TT is recommended as it can shut-out SMBs (with the
450 appropriate setting in preferences/Open APS SMB/autoISF settings/smb_delivery
451 settings/"enable alternative activation...".

452

453 Those of us who tend to over-treat hypos may prefer to set Hy2 (unless for night snacks->
454 Hy1): Reverting to standard loop aggressiveness with SMBs after/if a certain bg level
455 („threshold“, similar to our iobTH for meals) is surpassed, and we want our loop to react
456 again with SMBs before the set duration expires.

457

458

6.5 Mastering Exercise after a Meal

460

461 In Hybrid Closed Loop, we gave less insulin at meals (a reduced bolus) before exercise.

462 Since we now get our meal insulin automatically from the loop, we would have to at least
463 somehow tell it that exercise follows this time.

464 Simply setting an exercise profile *before* the meal would make our full closed loop too weak
465 in the "treatment" of the first glucose rise. **What we want is, to get our** (already, compared
466 to HCL, delayed) **meal insulin delivered as fast as possible by SMBs. It just should be**
467 **capped at the desired iob reduction.**

468 6.5.1 Manual mode requires 2 user interventions

469

470 What we can do, is (1) **reduce** the **iobTH** (via the `_%` setting, e.g. *by one third*).

471 • *In the example we were using, this would mean to reduce by 2 U to $iobTH^* = 4U$.*

472 • Do that estimate for your data, and think back how you did bolus reduction in hybrid
473 closed loop before same exercise.

474 • Likewise, you can use your profile ISF, e.g. *30 mg/dl/U* and „translate“ by how much
475 ($2U * 30 \text{ mg/dl/U} = 60 \text{ mg/dl}$) this „pulls you away from going into a hypo“.

476 • Using your IC (e.g. *8g/U*) you can also translate the iobTH reduction (2 U) into a
477 „snack equivalent“ ($2U * 8 \text{ g/U} = 16 \text{ g}$) that you „replace“ by thinking ahead and
478 „budgeting“ for some exercise with your iobTH modulation.

479 In this senario, our loop delivers SMB insulin as fast as always, only that when the last SMB
480 has passed the iobTH, the loop only has elevated %TBR to work with, meaning it cannot
481 raise iob by much any longer. This provides an elevated glucose level on which we enter
482 exercise, and saves us hypo danger or snack need (as calculated in above examples).

483

484 After this reduced iobTH is reached (or up to 30% exceeded by the last SMB, up to 20% @
485 even $TT > 100 \text{ mg/dl}$), step (2) must follow = an increased exercise **bg target** is set (see
486 [section 6.2](#)).

487

488 The problem with this approach is that it requires **two** user interventions, first **setting the**
489 **lower iobTH%**, and later (**and this in a time-critical manner**, after iobTH is exceeded), to
490 **input an exercise TT**, or to activate a related setting.

491 To eliminate this problem, the following refined solutions are suggested:

492

493 6.5.2 DIY cockpit: Using pre-set meal / exercise settings from a User action Automation

494

495 The „DIY cockpit“ user interface allows a *one-step* setting for meal + exercise that can be
496 selected in time-uncritical fashion, any time before the meal starts.

497 A detailed example is given in [case study 6.2](#):

498 A sequence of 3 Automations must be set up, of which only the first one must be manually
499 triggered, in just one time-uncritical key stroke from the AAPS home screen.

500 The others are activated automatically, when the respective Conditions are met.

501

502 Automation #1 provides, for a meal that precedes exercise, the full loop aggressiveness, but
503 makes sure that this aggressiveness stops immediately after a (reduced) iobTH is exceeded.
504 The reduced iobTH ensures that not too much insulin is on board for exercise after the meal.
505 Also it provides an elevated bg level at (re-)start of exercise.

506

507 In this Automation, the box “User action” should be permanently ticked. This will
508 automatically provide a **grey button on the bottom of the AAPS home screen** (“DIY
509 cockpit”) that can be freely named (= headline of Automation #1).

510 For exercise that is not done frequently, I choose to get rid of that cockpit button by disabling
511 the Automation fully, in my list of Automations... until the evening before e.g. a bike tour, when
512 I will want to have my cockpit give me the optional button again.(See [case study 6.2](#))

513

514 When the reduced iobTH is exceeded, two things need to be provided :

515 (1) a milder running FCL (reduced exercise %profile, after the meal rise had been
516 managed based on 100% profile boosted further by bgAccel_ISF driven full
517 loop aggressiveness) => Automation #2 sets e.g. 70% profile and ends TT

518 (2) setting an exercise TT (not possible with Automation #2. But *after* it terminated
519 the TT, an Automation #3 can immediately follow, and set the desired exercise
520 TT=125 (which implies the exercise mode

521 Note that Automations 2 and 3 are fully automatic, no User action is involved. See [case](#)
522 [study 6.2](#) for an example

523

524 Should, during the exercise, a need arise to modulate the loop aggressiveness (iobTH,
525 effective ISF), this can be done within 1-2 seconds, also right from the AAPS home screen
526 („FCL cockpit“), by setting a higher or lower temp. %profile, and/or by setting a higher or
527 lower temp. exerciseTT.

528 To make the loop temporarily act a bit more aggressive, switching the exercise button OFF
529 (from yellow to grey) could also be considered

530 **Defining User action - Automations to build your FCL cockpit**

531

532 If you want to develop *your* **DIY User Interface**, make sure you define suitable settings that
533 reflect ***your*** personal insulin sensitivity and data patterns.

534

535 **Caution:** As mentioned in other places, Automations can be tricky as to whether they
536 actually will ever work, because the loop goes through the exact **sequence of all your**
537 **active Automations**, and might be switched into a direction that no longer is compatible with
538 the conditions that must be a given, for the Automation you think that should kick in.

539

540 To have a clean AAPS home screen (and also to prevent unnecessary/accidental activation
541 by kids playing around with offered buttons), define reasonable time windows for each of
542 your shelved special routines, or keep them entirely dormant (de-activated) in the list of all
543 your Automations, and activate them only for/on the day when you think you might need
544 them

545

546 **6.5.3 Laissez-faire alternative**

547

548 You could make your life easier: **Just use** (as in Hybrid Closed Loop) **an exercise setting**
549 and accept a resulting reduced loop aggressiveness **already before meal start**. You would
550 go a bit higher in your glucose peak. As, in principle, a higher glucose level is desirable for
551 starting exercise, this can be a viable route, too, **especially if you do a** (often
552 recommended) ***protein-rich meal before exercise***.

553 Logic: For a high carb containing meal, we wanted in the preceding sections a strong initial
554 FCL response, but only up to a certain (lowered) iob. (This resembles the reduced user bolus
555 in HCL around exercise.). However, the more our meal shifts to high protein rather than high

carb load, and the more we are accepting of bg going a bit higher before we start or resume our exercise, the better we can tolerate a FCL aggressiveness also at meal start, i.e. the entire day.

Continue with [section 6.6](#)

Skip next section 6.5.4 – The following green texts (and embedded screenshots) describe currently not available features that were suggested for further development

6.5.4 Improved cockpit: Using pre-set meal / exercise combination from TT dialogue box

The improved „FCL cockpit“ User Interface (when available) also allows a one-step setting for meal + exercise that can be selected in time-uncritical fashion, any time before the meal starts.

It manages the meal with an appropriately reduced iobTH, and is programmed to automatically activate the exercise settings when iobTH is exceeded:

If in addition to meal, one of the 4 pre-programmed exercises is also selected from the bottom of the TT dialogue box, (for example, in case of biking after a hi carb lunch, hiC + bik, see [section 5.3.3.1](#).) then meal gets superseded /overridden with condition „duration = until when iobTH is first time exceeded“. Plus, that is the other important point, the activity-related reduced iobTH is taken over for the meal, too.

All this happens from the AAPS home screen and associated dialogue box from the TT field there.

Actual valid settings can at any time point be seen in the AAPS home screen (see [section 5.3.3.1](#) on extra data fields, above).

When your FCL is in this meal + exercise mode, you first see at the TT field ([section 5.3.3.1](#)) of your AAPS main screen:



... and when iobTH is the first time exceeded, this automatically switches to:



581

582

583 That 1-step setting can either be freely done according to [section 6.2](#)

584 Or you can just press one of your frequent meal and frequent exercise „codes“, as described
585 in [sections 6.3.2 and 6.3.3](#)

586 *Example: For mountain biking after pizza lunch* press two buttons, *piz* and *mtb*, in the
587 dialogue box of your AAPS home screen's TT field. That's all (...after, one time, you figured
588 out what settings suit that scenario, and you put it into /preferences, see [sections 6.3.2 and](#)
589 [6.3.3](#)).

590

591

592 6.6 Activity Monitor

593

594 An optional feature for times without serious exercise, but still suspected **effects on insulin**
595 **sensitivity** is the **activity monitor**.

596 It can be generally activated under /preferences/OpenAPS SMB/Activity modifies sensitivity)

597 If the user

598 • has scaling factors set there (in preferences/OpenAPS SMB/Activity modifies
599 sensitivity)

600 • has **no TT running**

601 • (and, regarding nighttime: did not opt for „ignore_inactivity_overnight“)
602 then AAPS automatically modulates for sensitivity changes **based on movement intensity**
603 for the last minutes to 1 hour time frame.

604 **Personalized tuning** of the **two scaling factors** is necessary in your FCL set-up phase. For
605 details see [section 3.4](#).

606 The Activity Monitor can also be used (overridden/ used for tuning the scaling factors)
607 from a dialogue box (*if already launched*) coming up from the exercise button (top
608 middle of AAPS home screen).

609

610

611 Effects from the Activity Monitor are hard-limited to go **maximally**

612 • **plus 20%** insulin at detected resistance (in-sensitivity to insulin) **at in-activity**

613 • **minus 30%** insulin at detected increased sensitivity to insulin due to **activity**.

614

615 **Note that Activity Monitor only works when no exercise (or other) TT is active:**

616 • Whenever you set a TT, you consciously go for a certain effect on the sensitivity ratio
617 to be used in that time window.

618 Usually it will be stronger than the tweaking that the Activity Monitor would do. But you
619 would not want the Activity Monitor interfere and additionally tweak things you just
620 defined differently for a certain situation, and time window, by setting a TT.

621 • During the set TT, your Activity Monitor **keeps collecting** the data on your
622 activity/in-activity. Immediately after the set TT ends, the Activity Monitor
623 **automatically resumes** its work

624 This is good news also for those who might use brief even/odd target switches (e.g.
625 when sneaking-in a small snack w/o triggering a SMB), but would hate to see their
626 Activity Monitor function go under for a while afterwards.

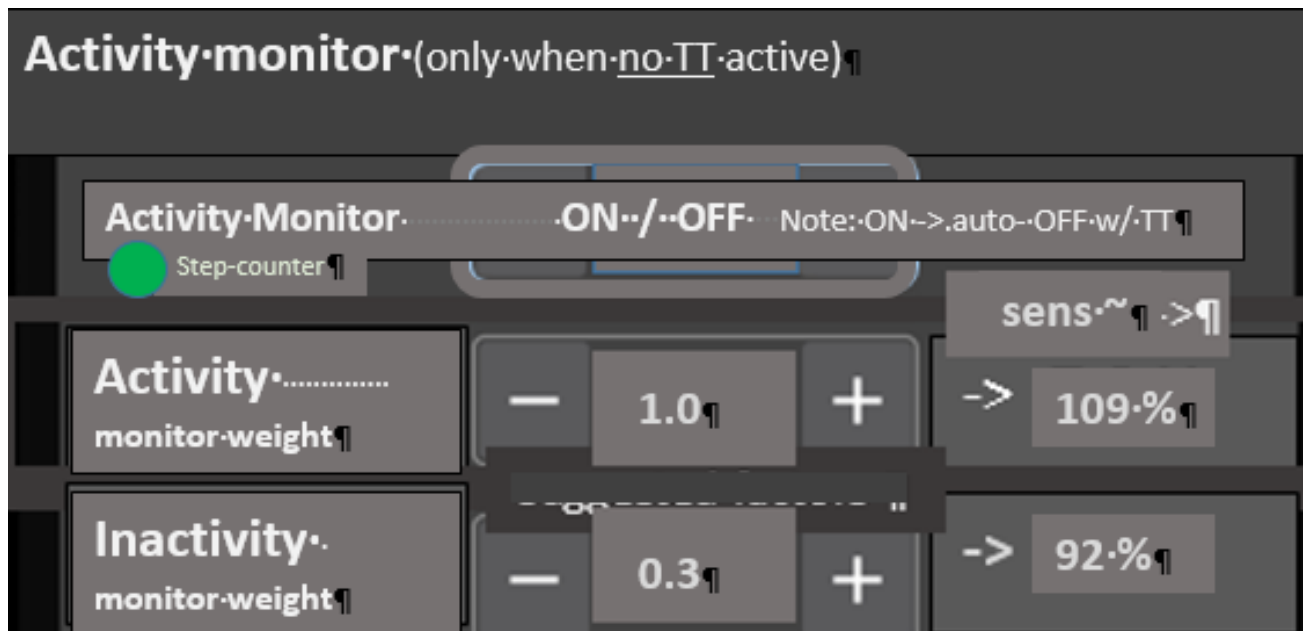
627

628 You can easy, in real-time, check the impact of your Activity Monitor on the sensitivity used
629 to calculate your insulinRequired in your AAPS **SMB tab**. From autoISF 3.0.1 onwards, this
630 is super easy to retrieve in 1st screen, on top of the autoISF results.

631

632 Idea for an eventual User Interface update for the Activity Monitor:

633 In this dialogue box (connected *in a future update* with the exercise button), the two scaling
634 parameters (set as default by the user during initial set-up in preferences) are displayed, and
635 can be temp. over written. (These settings will expire and revert to default as set in
636 /preferences, whenever the Activity Monitor closes (goes auto-off, or is pushed off)).



637

638 The resulting sensitivity effect is the roughly expected effect of requiring >100% insulin if
639 moving around a bit (activity), or needing a lesser %age when being very stationary.

640 It is displayed in the right side column of the dialogue box (*if already launched*) to give the
641 user a feeling for the expected effects from her/his „weight“ inputs.

642 The exact impact is calculated by the loop and shown on top of the autoISF results in the
643 SMB tab (every 5 minutes).