

6. Temporary Modulation for Exercise and lighter (In-)Activity V 3.4

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 stepcounter

[Available related case studies:](#)

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

Green texts describe currently not available features that were suggested for further development

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:

109

110

111 **Caution:** Watch out for another potential stumbling block,
112 because many Automations only work under the condition

112 that no TT is already running.

113

114 As temp. changing iobTH is quite tricky to automate, it is the author's preferred route to only

115 *indirectly* modify it – see next section.

116

117 6.1.3 Dynamic iobTH: iobTH modulation via setting a temp. glucose target

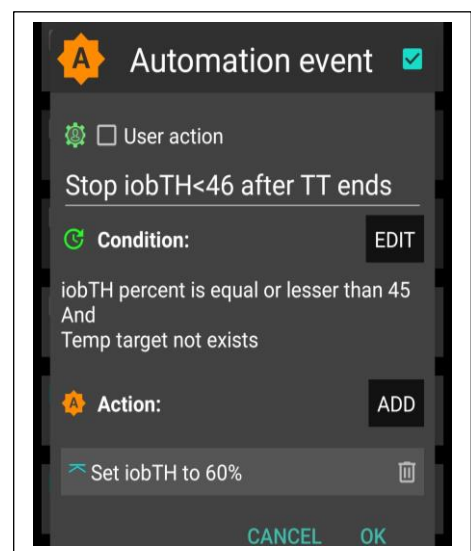
118 6.1.3.1 How does automatic sensitivity and iobTH adaptation work in the exercise mode?

119 In AAPS/Preferences, set “**High TT raises sensitivity** = TRUE”. Then, setting a temporary

120 glucose target (TT), modulates iobTH the same way as it modulates sensitivity (ISF).

121 **When. additionally. the exercise button is ON** (lit yellow), iobTH gets reduced

122 **particularly strong**, and ISF is **particularly weakened** (as desired for exercise). That



effect is the stronger (**ISF gets the weaker, iobTH the lower**), the lower you set the half-basal exercise target for your exercise mode in AAPS/preferences/OpenAPS SMB:

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

- @ half_basal_exercise_target you set in AAPS/preferences/OpenAPS SMB...

Choose a low number if you later want a high dynamic range of sensitivity modulation

Lower half-basal exercise target = lesser insulin delivered

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

Higher TT = lesser insulin delivered

... 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

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

Note that:

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

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

- **temp.ISF = profile ISF / sens.ratio**

- **temp.iobTH = set iobTH * 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.

145 6.1.3.2 How you recognize the real-time iobTH, and “aggressiveness” status of your FCL loop in
146 general

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

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

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

152 COMBOV2 SMB AUTO NSI :
Last run : 3/29/24 20:55
153 Result
154 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
155
156 $0.75 * 0.53 =$
157
158 start autoISF 3.0.1
159 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
160
161
162
163
164 end autoISF
165 currenttemp: 0 lastTempAge: 0
m tempModulus: 21 m
profile.sens: 39 sens: 113.2
166 $= 39 / 0.34$

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 57.1 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%)
154 $0.75 \text{ profile basal} * 70\% = 0.52$
temp.profile basal
 $0.52 * 0.53 =$
155
156 $57 \text{ temp profile ISF} = 57 / 0.53$
157
158
159 $= 60\% * 0.53 * 70\%$

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

172 From the figures given (left side), the user’s iobTH calculates to 6.0 U (= (60%/32%)*3,18U)
173 which is 60% of iobMAX of 10.0 U. So, normally, autoISF FCL could give SMBs up to

174 anywhere between 6.0 U and 7.2 U (=6.0 +20%; see [section 2.4](#) at step 2.4: at bg>100, iob
175 can run max. 20% over with “last” SMB). For doing exercise, this window shrinks now to 3.18
176 – 3.82 U (left) or, even to 2.23 – 2.77 U (right).

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

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

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

185 6.1.3.3 Customization and-tuning

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

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

- 188 • ... in tandem with reasonable TTs that you like to use later, for each of your
189 intended specific exercises
- 190 • Iterate through this a couple of times (whenever you happen to do *that*
191 exercise).

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

196

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

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

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

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

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

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

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

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

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

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

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

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

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

228

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

232

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

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

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

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

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

6.1.4 Tweaking iobTH

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

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

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

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

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

6.2 Temporary % profile switch

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

262 This setting would **multiply** with the results in above table and further reduce basal and
263 **ioBTH** (whenever exercise button AND profile button both are yellow).

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

265

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

268

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

272 • Often the %profile modulation is used for several hours if not days to accommodate “long
273 waved” sensitivity swings (See e.g. in [case study 6.2](#)).

274 • Instead, or even additionally, the percentage might be modified for just a couple of
275 minutes, or for one special snack or meal duration, to “nudge” the proportionally
276 modulated aggressiveness of the FCL (see [section 5.2.3](#)).

277

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

281

282 6.3 Managing exercise via Cockpit inputs

283

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

286

287 6.3.1 Basic Settings for Exercise

288

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

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

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

295

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

298

299 6.3.2 „Dynamic“ exercise mode off = traditional AAPS exercise mode (YGY)

300

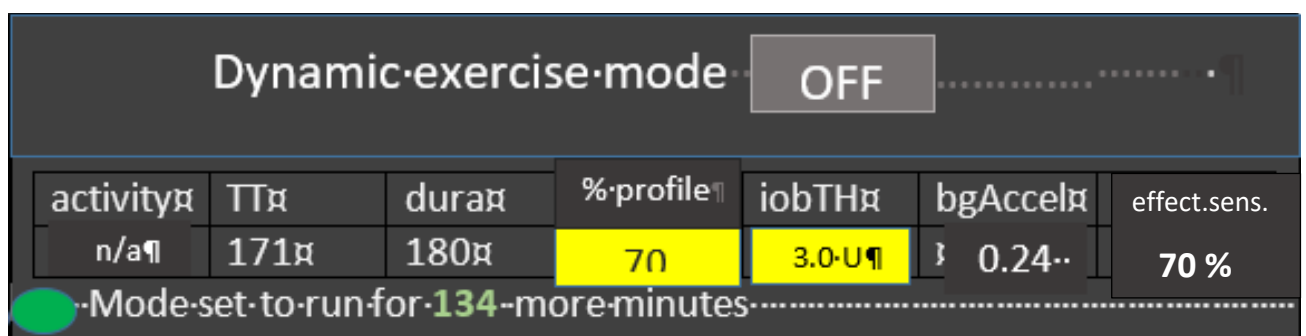
301 When the dynamic exercise mode is off, you still have the instruments for *exercise*
302 *management just as you always had it in the past* = a combination of manually softened
303 aggressiveness via setting a temp. %profile change, and orienting corrections towards an
304 elevated TT.

305

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

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

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



312

313 % profile can be changed:

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

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

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

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

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

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

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

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

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

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

344 6.3.3 Dynamic exercise mode ON (GY or YY)

345

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

349

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

352 Then, when you look into the exercise button in the middle of your FCL cockpit the dynamic
353 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

354

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

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

- 361
- 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
- 362
- 363 effective sensitivity %, accordingly.

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

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

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

375

376 6.3.4 Dynamic exercise mode ON plus %profile change (YYY)

377

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

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

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

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

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

394

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

- 396 • yellow -> off/grey = increase

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

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

399 6.4 Option to pre-set for 4 kinds of exercise or meals (for 1 button operation)

400

401 You may want to skip section 6.4 because (green texts) mostly it is about suggested
402 further features in future software updates

403

404 6.4.1 iob_threshold_percent

405

406 In AAPS preferences/OpenAPS SMB/autoISF settings / Full Loop Settings, the default
407 iob_threshold_percent used for the normal meal spectrum is defined.

408 In an updated later autoISF version you might be able to differentiate there for up to 4 meal
409 clusters (see next section)

410

411 6.4.2 Pre-settings for (up to) 4 kinds of exercise:

412

413 In AAPS preferences/OpenAPS SMB/autoISF settings / Full Loop Settings: follows next input
414 fields for pre-settings you can define for (up to) 4 kinds of exercise:

415 The following table gives an example of settings you may find well-suited for 4 of your
416 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			

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

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

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

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

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

425

426 6.4.3 Pre-settings for (up to) 4 kinds of meals:

427

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

429 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	

430

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

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

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

438 6.4.4 Pre-settings for (up to) 4 kinds of Hypo treatment:

439

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

441 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	

442

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

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

447

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

452

453

454 6.5 Mastering Exercise after a Meal

455

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

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

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

463 6.5.1 Manual mode requires 2 user interventions

464

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

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

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

469 • Likewise, you can use your profile ISF, e.g. *30 mg/dl/U* and „translate“ by how much
470 ($2U * 30 \text{ mg/dl/U} = 60 \text{ mg/dl}$) this „pulls you away from going into a hypo“.

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

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

478

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

482

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

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

487

488 6.5.2 DIY cockpit: Using pre-set meal / exercise settings from a User action Automation

489

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

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

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

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

496

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

501

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

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

508

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

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

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

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

518

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

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

525 Defining User action - Automations to build [your](#) FCL cockpit

526

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

529

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

534

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

540

541 [6.5.3 Laissez-faire alternative](#)

542

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

548 Logic: For a high carb containing meal, we wanted in the preceding sections a strong initial
549 FCL response, but only up to a certain (lowered) iob. (This resembles the reduced user bolus
550 in HCL around exercise.). However, the more our meal shifts to high protein rather than high
551 carb load, and the more we are accepting of bg going a bit higher before we start or resume
552 our exercise, the better we can tolerate a FCL aggressiveness also at meal start, i.e. the entire
553 day.

554 Continue with [section 6.6](#)

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

557 6.5.4 Improved cockpit: Using pre-set meal / exercise combination from TT dialogue box

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

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

563

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

569

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

572 Actual valid settings can at any time point be seen in the AAPS home screen (see [section](#)
573 [5.3.3.1](#) on extra data fields, above).

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



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



576

577

578 That 1-step setting can either be freely done according to [section 6.2](#)
579 Or you can just press one of your frequent meal **and** frequent exercise „codes“, as described
580 in [sections 6.3.2 and 6.3.3](#)
581 *Example: For mountain biking after pizza lunch press two buttons, `piz` and `mtb`, in the*
582 *dialogue box of your AAPS home screen's TT field. That's all (...after, one time, you figured*
583 *out what settings suit that scenario, and you put it into /preferences, see [sections 6.3.2 and](#)*
584 *[6.3.3](#)).*

585

586

587 6.6 Activity Monitor

588

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

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

592 If the user

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

595 • has **no TT running**

596 • (and, regarding nighttime: did not opt for „ignore_inactivity_overnight“)

597 then AAPS automatically modulates for sensitivity changes **based on movement intensity**

598 for the last minutes to 1 hour time frame.

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

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

604

605

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

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

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

609

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

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

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

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

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

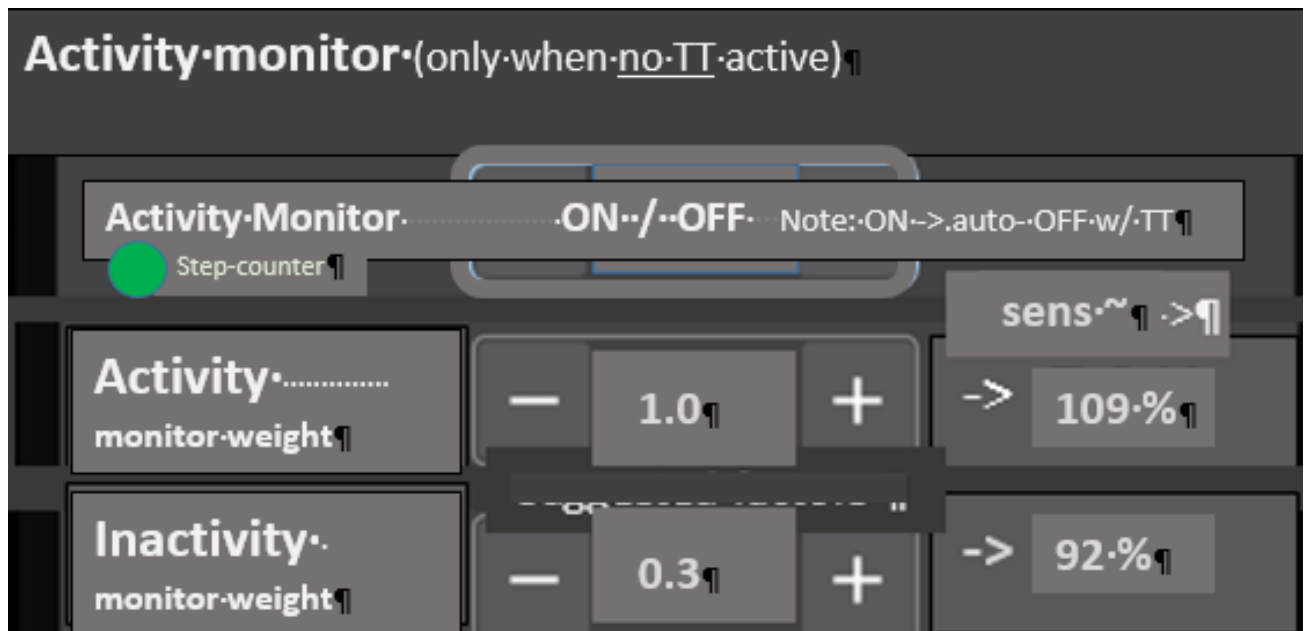
622

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

626

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

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



632

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

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

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